MICROCOPY RESOLUTION TEST CHART
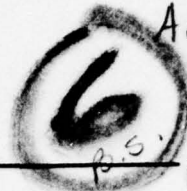
LEVEL III
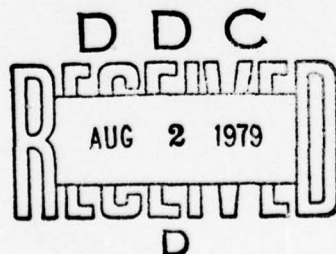
AD-E100 247

FINAL REPORT

Integrated AUTODIN System (IAS)

CATEGORIZATION AND SPECIFICATION REQUIREMENTS FOR A COMMON FAMILY OF AUTODIN TERMINALS

DCA100—77—C—0057

Task 7-78/3/7

May 1, 1979

Communications and Information
Technology Division

BOOZ
ALLEN

79 07 24 011

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
Task 7-78/3/7		

4. TITLE (and Subtitle)	5. TYPE OF REPORT & PERIOD COVERED
Categorization and Specification Requirements for a Common Family of AUTODIN Terminals	Final Report
	6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
W. Landis, S. Garber, R. Letner	DCA100-77-C-0057

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT PROJECT TASK AREA & WORK UNIT NUMBERS
Booz, Allen & Hamilton, Inc. 4330 East West Highway Bethesda, Maryland 20014	N/A

11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE
Defense Communications Engineering Center Computer Systems Architecture Branch, Code R810 1860 Wiehle Avenue, Reston, Virginia 22090	May 1979
	13. NUMBER OF PAGES
	87

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report)
N/A	UNCLASSIFIED
	15a. DECLASSIFICATION DOWNGRADING SCHEDULE N/A

16. DISTRIBUTION STATEMENT (of this Report)

A. Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

N/A

18. SUPPLEMENTARY NOTES

N/A

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

IAS Terminals
AUTODIN Terminals

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents results of an analysis conducted to determine specification requirements for a common family of AUTODIN terminals. It defines a set of standard terminal functions, describes a set of terminal categories and identifies which functions in each category must be defined further, and specified to ensure consistency with the Integrated AUTODIN System Architecture.

DD FORM 1473 EDITION OF 1 NOV 65 IS OBSOLETE
1 JAN 73

UNCLASSIFIED

Executive Summary

Commencing with its appointment by OSD/DTACCS (now ASD/C^{3}I) in early 1975 as the AUTODIN system manager, the Defense Communications Agency (DCA) has had responsibility for development of an Integrated AUTODIN System Architecture (IASA). The approved DCA development plan for the IASA addresses the backbone network, concentrators, and terminals as a single integrated system with processing functions allocated to system components on the basis of how and where they can best be performed. Recent IASA development activity has culminated with the definition of a recommended system architecture on a terminal-to-terminal basis. Current efforts are being directed toward functional specification of a common family of terminal systems for the IASA with emphasis on application of off-the-shelf hardware and functionally standard software modules. This report presents results of an analysis conducted to determine specification requirements for a common family of AUTODIN terminals. It defines a set of standard terminal functions, describes a set of terminal categories based on the standard functions, and identifies those functions within each category that must be defined and specified in order to ensure consistency with the IAS architecture.

Six basic functional elements encompassing the full range of terminal capabilities envisioned for the IAS are introduced:

- Communications Interfaces
- Communications Processing
- Message Processing
- Transfer and Control
- Man/Machine Interfaces
- General Purpose Processing

Each of these elements is comprised of a set of functions derived from current AUTODIN capabilities and projected capabilities for the IASA.

The functional elements are used to define the following terminal categories of a common family of AUTODIN terminals:

I   - Network Access Devices
II - Communications Concentrators
III - Interactive Terminals
IV - Basic AUTODIN Digital Terminals
V   - Advanced AUTODIN Digital Terminals
VI - Message Processing Nodes
VII - Host Computers

ii

The categories allow the grouping of terminals according to application and overall capabilities rather than existing configurations or specific capabilities. This structure promotes functional standardization while allowing for definition of additional categories if required.

Each terminal category can be defined in terms of the functional elements necessary to support the role of that category in the IAS architecture. A functional block diagram is used in this document to illustrate the functional differences among the terminal categories. As terminal complexity and purpose vary from one category to the next, not every category will include or require every functional element in its definition. This approach represents a first step toward achievement of true functional modularity within the common family of AUTODIN terminals.

The report concludes with recommended assignments of responsibility between the DCA and user communities for the specification of each function within each terminal category. Specification responsibility for a given function may vary from one terminal category to the next; it can rest solely within either the DCA community or the user community, be shared between the two communities, or not be required at all depending on the category being addressed. Summaries of the recommended specification responsibilities are presented in tabular form. An appendix contains general outlines to be used as guidelines in preparation of the terminal functional specifications.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

I. INTRODUCTION

1. BACKGROUND

In July, 1974, the General Accounting Office (GAO) published a report that was critical of the Department of Defense (DoD) for (1) not having a single agency responsible for management of the entire AUTODIN system to include AUTODIN terminals; (2) for a poor telecommunications center consolidation record; and (3) for duplication of effort and proliferation of LDMX-type AUTODIN terminals by the Military Departments (MILDEPs) and DoD Agencies. The GAO recommended to OSD/DTACCS (now ASD/C^3I) that a single AUTODIN manager be appointed to resolve the problems as they surfaced.

In February, 1975, OSD/DTACCS acted on the GAO recommendation by tasking the Defense Communications Agency (DCA) in coordination with Services/Agencies, to develop an Integrated AUTODIN System Architecture (IASA) on a terminal-to-terminal basis and based on that architecture to define a common family of AUTODIN terminal hardware and software.

On 12 December 1975, OSD/DTACCS approved the DCA IASA development plan which would address the backbone, concentrators, and terminals as a single integrated system with processing functions allocated to system components on the basis of how and where they can best be performed. As a result of this plan, DCA is responsible for accomplishing three objectives: (1) develop a system architecture on a terminal-to-terminal basis; (2) develop terminal specifications; and (3) develop related standards, formats, and procedures.

In DCEC's TN Number 17-77, "Architectural Directions for an Integrated AUTODIN System," December 1977, objective number (2) was further defined to include functional specifications for a common family of terminal systems with emphasis on application of available off-the-shelf equipment. This report describes the initial efforts toward achieving that objective.

2. PURPOSE

This report presents the results of Task 7-78/3/7 of contract DCA100-77-C-0057. The purpose of the task is to categorize and develop specification requirements for a common Family of AUTODIN Terminals. The task was conducted with two major objectives in mind. The first objective was to identify a series of terminal categories ranging from simple teletypewriter terminals to future advanced automated message service exchanges. These categories must cover the existing and planned AUTODIN I and AUTODIN II terminals and allow for further terminal developments within the categories. The second objective was to identify the functions performed within each category for which standard functional specifications are required.

With these objectives in mind, it was the purpose of this task to provide a list of the functions by category as well as preliminary assessment of the functional area specification responsibility (e.g., DCA or users). It is noted that the functional capabilities described in the report are defined in accordance with the proposed IAS architecture and functional allocation developed in the IAS Mid-Term Architecture Definition Task 1-78/1/6 (Reference 1).

3. SCOPE

For the purpose of this analysis, a "terminal" is considered to be any device or equipment configuration which connects directly to the backbone switching network to provide user access to the system. Terminals therefore include interface devices, multiplexers/concentrators, host computers and message processing exchanges. This report does not describe or evaluate previously defined categories such as the Standard AUTODIN Terminals (SAT) nor does it attempt to catalog all existing or planned terminals by category. Such lists and category descriptions are amply defined in References 2 and 3. Further, it is not intended for this task to describe in detail the functional requirements for each category of terminal. Rather, this task is intended to provide a sound organizational structure for the development of detailed terminal specifications in subsequent efforts. Accordingly this report defines a set of standard terminal functions, describes a set of terminal categories based on these standard functions and identifies those functions within each category that must be defined and specified in order to ensure consistency with the IAS architecture. Appendix A of this report includes preliminary specification outlines for each of the standard terminal categories.

4. APPROACH

A method of categorizing terminals within a standard AUTODIN family was sought which would:

.   Group terminals in terms of application and overall capabilities (rather than existing configurations or specific characteristics)

.   Ensure functional standardization within categories, but allow flexibility of functional application and "technique" within the categories

.   Provide a structure which would allow for definition of additional categories as necessary.

To satisfy these objectives, the following approach was adopted.

A generalized functional block diagram was developed which comprises the basic functional elements of the full range of terminal capabilities envisioned for IAS. These functional elements are:

- Communications Interfaces
- Communications Processing
- Message Processing
- General Purpose Processing
- Man/Machine Interfaces
- Transfer and Control

Functions applicable to each of these functional elements were then identified based on current terminal capabilities and IAS architectural directions. Terminal categories were then defined to meet existing and planned applications based on the applicability of the functional elements and the specific functional capabilities within each element.

Chapter II describes the elements of the generalized functional block diagram and defines each of the terminal functions. The terminal categories are described in Chapter III. Chapter IV addresses responsibility for functional specifications of the terminal categories. Appendix A provides preliminary outlines of the recommended functional specification formats.

II. DEFINITION OF TERMINAL FUNCTIONS

II. DEFINITION OF TERMINAL FUNCTIONS

1. GENERAL

A generalized functional block diagram of the common family of AUTODIN terminals is presented in Figure II-1. As discussed in Section I, the categories of terminals within the common family are defined in terms of the elements of this block diagram. Each of the elements of the functional block diagram is defined in Paragraphs a through f below.

a. <u>Communications Interfaces</u>. This element consists of terminal functions required to support communication links to remote terminals or other network elements. These interfaces include physical and electrical interfaces as well as link level protocols. Depending on the category, a terminal may provide one or multiple types of communications interfaces.

b. <u>Communications Processing</u>. This element consists of those functions required to provide interoperation between the terminal and other network elements via the network. Included in communications processing are network level protocols and other functions related to routing, distribution and control of messages.

c. <u>Message Processing</u>. This functional element provides user related message preparation and translation functions. Depending on the terminal category, these services may be accessed from remote terminals or local devices. Typical message processing functions are format verifications, format conversions and operator assistance functions such as editing and prompting.

d. <u>Transfer and Control</u>. This functional element provides for interoperation among the other functional elements. It includes the necessary physical, electrical and functional interfaces, buffering and control logic to allow the transfer of data between the other functional elements.

e. <u>Man/Machine Interfaces</u>. This functional element provides the necessary interfaces to input/output devices supporting human interaction with the terminal. These input/output devices include alphanumeric keyboards, video display units, line printers, card readers/punches, and paper tape readers/punches. They will typically be either physically integral parts of the terminal or linked directly to the terminal in accordance with non-standard communications connections imposed by hardware characteristics of the terminal.
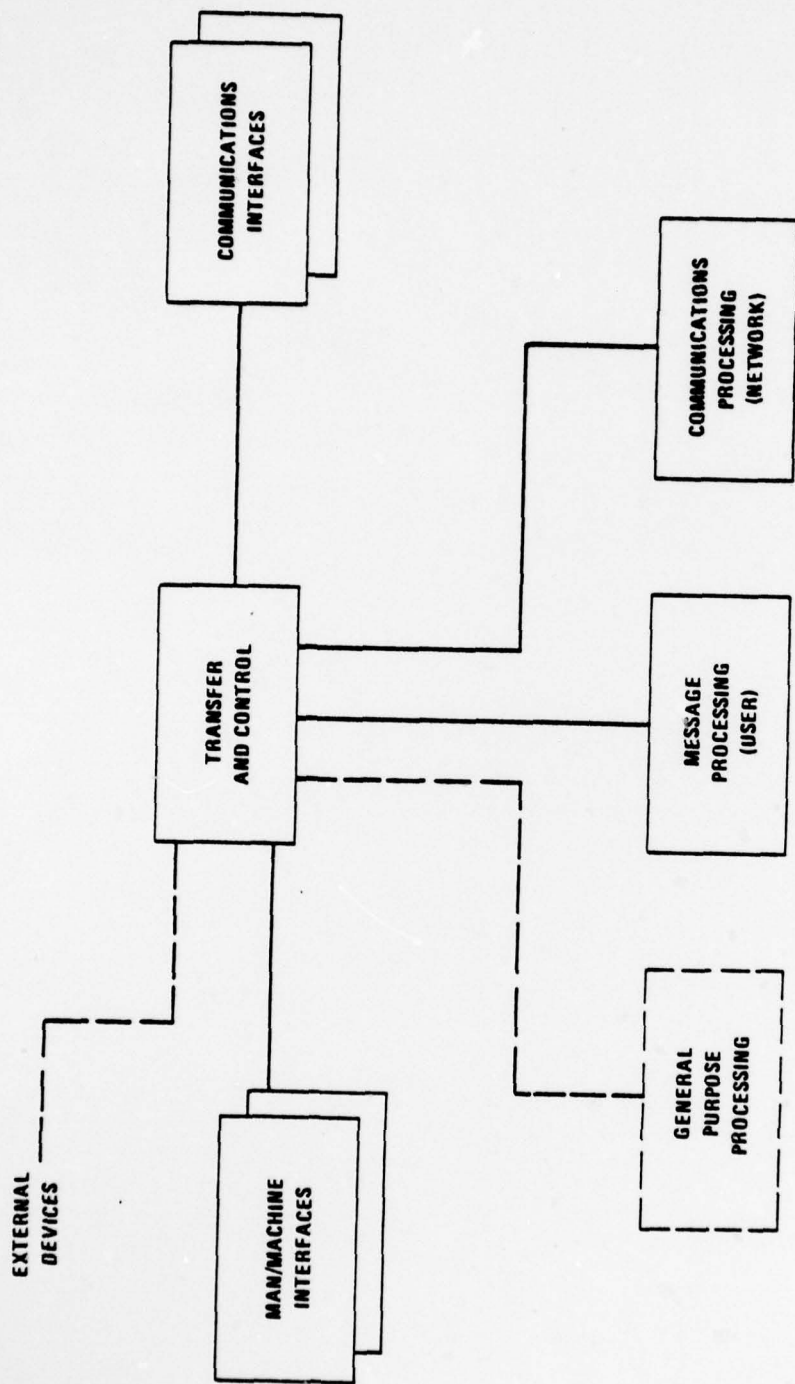
Figure II-1. Common Family of AUTODIN Terminals Functional Block Diagram

f.   General Purpose Processing. This functional element encompasses processing outside the scope of the message processing and communications processing elements. The more sophisticated network terminals may have the processing capacity to execute user applications which either augment the message and communications processing functions of the terminal or require no network resoures (e.g., local batch programs). General purpose processing functions are considered to be user specified and therefore are not included in the terminal category definitions. However, they are addressed generically in this definition of the standard family of terminals for the purpose of completeness and as a means of emphasizing the capability of some terminals to perform processing beyond that required for network operations.

The External Devices depicted in Figure II-1 are also included for the purpose of completeness. An external device is defined as any equipment which connects to the terminal by means of a non-standard communications interface and which typically supports machine-to-machine interaction. Such devices include computer interfaces, direct memory access interfaces, and sensors or other non-standard data entry/collection devices. External devices are considered to be user unique. Their communications interfaces to the terminal therefore are not included in the terminal category definitions.

2.   DEFINITION OF FUNCTIONS

The following paragraphs contain definitions of the major functions within each of the functional elements described in the preceding section. These functions are based on existing AUTODIN terminal capabilities and functional capabilities projected for the Mid-Term IAS Architecture.

a.   Communications Interface Functions. The functions included in the communications interfaces functional element comprise the most basic terminal capabilities that require standard functional specification. The following paragraphs briefly describe the major functions included in the Communications Interface element.

(1)   Type and Characteristics of Lines. Each type of communications line that the terminal family is required to support will require specification in terms of data rate, timing discipline, transmission mode, data format and code.

(2)   Link Protocols. The operational and interface requirements of the link protocols constitute an important functional area to be specified. In each terminal category, the communications interface element contains the required link protocol functions. A list of anticipated link protocols to be supported by the IAS terminal family is

II-3

presented in Figure II-2. These link protocols are described in various DoD and commercial specifications (with the possible exception of some of the host and subscriber specified protocols).

(3) Concentration and Multiplexing Characteristics. The modes, timing and capacities of any concentration and/or multiplexing techniques must be specified as part of the communication interface functions.

(4) Interoperability Requirements. The requirement to interoperate with other terminals and network elements must be specified. Interoperability and the specified Link and Network protocols will be closely related in most of the standard terminal specifications.

(5) Electrical Interfaces. The specification should indicate the types of electrical interfaces required at the communications interfaces. These include electrical standards such as EIA RS 232, RS 422, RS 423, and RS 449; MIL-STD-188-114; and FED STD 1003, as well as the characteristics of modems, external clocks, cryptographic interfaces, etc.

(6) Special Interfaces. This function includes special interfaces to the COMSEC subsystem; patch and test facilities needed for terminal interface diagnostics; and specialized facilities such as satellites, the Public Data Network (via the CCITT X.25 protocol), and NATO NICS TARE tactical communications interfaces.

(7) Special Connection Function. This function refers to the capability of the communication interface to be dual-homed or to handle special connections such as polled networks (e.g., multipoint and loops).

(8) Operational/Maintenance/Test Support. These functional areas describe the capability of the functional element to provide operational, maintenance and test support to the various communications interfaces that it supports. Examples of these functions include error status monitors on the communications media and the capability to perform diagnostics and self or loop-back tests on the link protocols.

b. Communications Processing Functions. The capabilities and functions of the Communications Processing element are designed to support the user in his interaction with the network. The complexity of this functional element will vary with the complexity of the terminal category and the number and types of users it is designed to support. The following paragraphs present a brief discussion of the major Communications Processing functions.

NETWORK ELEMENTS	PSN	I-S/A AMPE(E)	I-S/A AMPE	AMPE	HOST	TERMINAL
PSN	VI	VI	VI	*I	VI	I, IB, IIA, VI
I-S/A AMPE(E)	VI	*VI	VI	I	NA	**I, IB, II, IIA, V, VI, SS
I-S/A AMPE	VI	VI	*VI	I	NA	**I, IB, II, IA V, VI, SS
AMPE	*I	I	I	NA	NA	**I, II, V, SS
HOST	VI	NA	NA	NA	NA	HS
TERMINAL	I, IB IIA, VI	**I, IB, II, IIA V, VI, SS	**I, IB, II, IIA, V, VI, SS	**I, IB, II, IIA, V, SS	NA	NA

* THESE CONNECTIONS WILL BE CONSIDERED ON A CASE-BY-CASE BASIS.
** ALL AMPES DO NOT HAVE ALL MODES.

NA   –   NOT APPLICABLE
I   –   AUTODIN I MODE I, CHARACTER SYNCHRONOUS
IB   –   AUTODIN II MODE IB, CHARACTER SYNCHRONOUS
II   –   AUTODIN I MODE II, CHARACTER ASYNCHRONOUS (UNCONTROLLED)
IIA –   AUTODIN II MODE II, CHARACTER ASYNCHRONOUS
V   –   AUTODIN I MODE V, CHARACTER ASYNCHRONOUS (CONTROLLED)
VI   –   AUTODIN II MODE VI, BINARY SYNCHRONOUS
HS   –   HOST SPECIFIED
SS   –   SUBSCRIBER SPECIFIED

Figure II-2. Link Protocols

(1) <u>Network Level Protocols</u>. The more advanced categories of AUTODIN terminals will utilize a host level protocol defined for AUTODIN II. The protocol function includes the Segment Interface Protocol (SIP), the Transmission Control Program (TCP), File Transfer Protocol (FTP), and possibly a Virtual Message Protocol (VMP) for exchanging user message and service message traffic through the network. New capabilities such as data teleconferencing and mailbox services would also be included in the network protocol function.

(2) <u>Single/Multiple Virtual Connection Capability</u>. The complexity of the Communications Processing function will vary somewhat between terminal categories based upon the capacity for supporting single user connections versus multiple user connections. This virtual connection management function will reside in the Communications Processing element and is essentially part of the TCP function.

(3) <u>RI/Logical Address Conversion</u>. The RI/logical address conversion will be specified within the communications processing element. Address conversions may be performed automatically or with the assistance of either a terminal operator or user depending upon the complexity of the terminal category.

(4) <u>Message Routing and Distribution to Message Service Subscribers</u>. The Communications Processing function will be responsible for the local and remote distribution of messages based on routing and logical distribution supplied by the Message Processing function. This function shall support message distribution to not only locally connected message service users but also to remote message service users accessible via network connection.

(5) <u>Interoperability and Special Connections</u>. The Communications Processing function will be required to accomplish connections to other networks, through Gateways, in addition to supporting special user connections such as teleconferencing and end-to-end encrypted transactions via the BLACKER COMSEC subsystem.

(6) <u>Communications Management/Control and Testing</u>. A major function of the Communications Processing element is to monitor the activity of the communications environment. This function includes maintenance of an activity log, collection of utilization and error statistics, as well as maintaining a connection status monitor. In addition, the Communications Processing element will perform any required test procedure between the terminal and elements of the network.

c.   Message Processing Functions. The Message Processing element
contains functions designed to determine the content of the messages/
data handled by the terminal. In essence, the Message Processing func-
tions determine the ultimate source of destination of user data whether
it be a local or remote (network) destination. It also provides the
necessary message preparation and addressing assistance to the user.
The following list presents the major message processing functions that
will be contained in this element.

(1) Message Processing Accessability. Functional require-
ments in this area determine the accessability of message processing
functions to various users (i.e., local, directly connected or remote
via the network).

(2) Message/Data Content Analysis and Distribution
Determination. This function determines the content of each message by
processing each format line until all origination and destination para-
meters have been identified. The distribution determination is based on
user-provided distribution criteria which include routing line parameters,
unique handling indicators, references, and key words and phrases.

(3) Message Preparation and Editing Aids. This message
processing function refers to the capability of users to enter or com-
pose messages from keyboard/entry devices. For large terminals and
message processing exchanges, these aids will consist of preformatted
message masks, addressing assistance, and format validation for the
various message fields. Edit and storage functions may also be offered
by the message processing element as a service to its users.

(4) PLA/RI Conversion. This function is the capability of
the Message Processing element to convert plain language addresses (PLA)
to routing indicators (RI) in accordance with the routing documents,
ACP-117, ACP-112, ACP-100, and DOI-102.

(5) Generation/Delivery of Service Messages. The Message
Processing functional element will be responsible for the generation and
delivery of service messages (SM) both from the standpoint of operator
generated SM's and those which are automatically generated. In addition,
the function will also include the capability for interpreting incoming
service messages from other users and network elements.

(6) Message Processing Utilization and Statistics Gathering.
This function of the Message Processing element will allow the terminal
and message exchange users and managers to determine the degree of
utilization efficiency being obtained by the message processing service.
This function will generate statistics which may be processed by the
Transfer and Control functional element for the purpose of developing
system reports.

(7) <u>Accountability and Record Keeping</u>. This is a major function required of the Message Processing element in support of the system's message service users and the restart/recovery mechanism. The record keeping consists of journals and history files as well as up-to-date maintenance of the PLA/RI files. In addition, current activity snap-shots are required to ensure efficient recovery from failures.

d. <u>Transfer and Control Functions</u>. The Transfer and Control functional element contains the basic terminal systems decision making logic as well as the interface control for the external devices. In smaller terminal configurations, the transfer and control functions will consist of minimum control logic and status management. In larger terminal and message exchanges the Transfer and Control will most likely contain the system's executive software module. The following paragraphs detail some of the various transfer and control functions that should be specified for the terminal categories.

(1) <u>Terminal Systems Management and Executive Control</u>. This function refers to the capabilities of the terminal's control logic and/or executive program to manage the terminal system and its processing elements. These functions include process resource and memory/buffer allocation, process-to-process interaction control and transaction audit/trace capability.

(2) <u>User to System Dialogue Translation and Control</u>. This function refers to the capability of the system to interpret operator/user and external device comments as well as provide code conversion and translation between the user/external devices and other system functions. Once the user dialogue or other input commands have been interpreted, the user or external device can be directed to other functional elements as required.

(3) <u>External Device Interface Control</u>. This function of the Transfer and Control element will control the non-standard communication interfaces between external devices and the terminal.

(4) <u>Security Monitor</u>. Security validation and user log-on and authentication will be a major functional responsibility of the Transfer and Control element. The capabilities of the security monitoring functions will vary among terminal categories. The larger terminal and message exchanges that support multiple users will require extensive security functions such as user authentication and multiple security level separation capability.

(5) <u>Failure Management</u>. The Transfer and Control element will contain the required logic to detect and report on the status of system failures. The range of failure management functions include operator notification, I/O and facility failure detection/reporting, systems reconfiguration management and background mode test and diagnostics.

(6) <u>Statistics and Report Generation</u>. A major function for the Transfer and Control element will be to gather statistics information from the other functional elements and generate statistical reports about the operation of the terminal system. The report generation capability may include activity logs, terminal/message service utilization reports and user/subscriber billing functions.

e. <u>Man/Machine Interfaces</u>. The Man/Machine Interface functional element will control the various I/O media which support human interaction with the terminal. All such media are considered to be integral parts of the terminal whether they be physically integrated in the terminal hardware itself or directly connected to the terminal by means of a non-standard (usually hardware unique) communications interface. The following paragraphs discuss some of the major functions that should be specified for the man/machine interface functional element.

(1) <u>I/O Media Interface Control</u>. This function will accomplish the interface processing necessary to control the various media devices integrated in the terminal system. The functions include the bit/byte handshaking and media status and error control.

(2) <u>I/O Media</u>. These functions list the types of I/O Media that will most likely be supported by the various terminal categories. Typical I/O devices include:

- . Hardcopy Output
- . Keyboard Input
- . CRT Output
- . Paper Tape Input/Output
- . Card Input/Output
- . OCR Input
- . Magnetic Media Input/Output
  - - 7 Track tape
  - - 9 Track tape
  - - Cassette tape
  - - Disk
- . Computer Output to Microfilm (COM)
- . Digital Voice Input/Output

(3) <u>Failure Management</u>. This function refers to the capability for the Man/Machine interface to notify the terminal operator and act upon failures within the I/O media and the terminal system control. This is an important function due to the fact that the system snapshot data and current program library will usually be resident on some form of I/O media (e.g., magnetic storage). Therefore, restart/ recovery and system reconfiguration management depend upon the capability of this functional element to reinitialize the relevant I/O media.

III. DEFINITION OF TERMINAL CATEGORIES

III. DEFINITION OF TERMINAL CATEGORIES

This chapter provides a general description of each Terminal Category identified for the common family of AUTODIN terminals. The categorization is based on the applicability of major functional elements and function allocations within the elements as described in Section II.

1. CATEGORY I - NETWORK ACCESS DEVICES (NAD)

The NAD category of terminals shown in Figure III-1 provides network access for user specified external devices. The external devices are not considered part of the terminal. Typical devices for which network access is provided are sensors and computer interfaces. The functional elements of the NAD category are:

- Transfer and Control - Contains the interfaces and controls to provide direct transfer of data between the external devices and the Communication Interfaces or the Communications Processing functions.

- Communications Interfaces - Provide a single interface to a higher level network element (PSN, AMPE, I-S/A AMPE or I-S/A AMPE(E)), or may be dual homed to two of these elements.

- Communications Processing - Provide, when required, network level protocol functions (e.g., Segment Interface Protocol, Transmission Control Program).

Examples of Category I terminals are the Single Channel Control Unit and Multiple Channel Control Unit which provide Host interfaces to AUTODIN II. AUTODIN I control units such as the Common Control Unit (part of the Digital Subscriber Terminal Equipment) and the Programmable Terminal Controller also fit into this category.

2. CATEGORY II - COMMUNICATIONS CONCENTRATORS (CC)

The CC is shown in Figure III-2. It provides network access for a number of remote subscribers. Terminals in this category range from simple multiplexers to store and forward concentrators. The functional elements of the CC category are:

- Transfer and Control - Provides direct transfer of data between remote subscriber Communications Interfaces and the network Communications Interface, or between Communications Interfaces and the Communications Processing functions.

COMMUNICATIONS INTERFACES

COMMUNICATIONS PROCESSING (NETWORK)

TRANSFER AND CONTROL

MESSAGE PROCESSING (USER)

EXTERNAL DEVICES

MAN/MACHINE INTERFACES

GENERAL PURPOSE PROCESSING
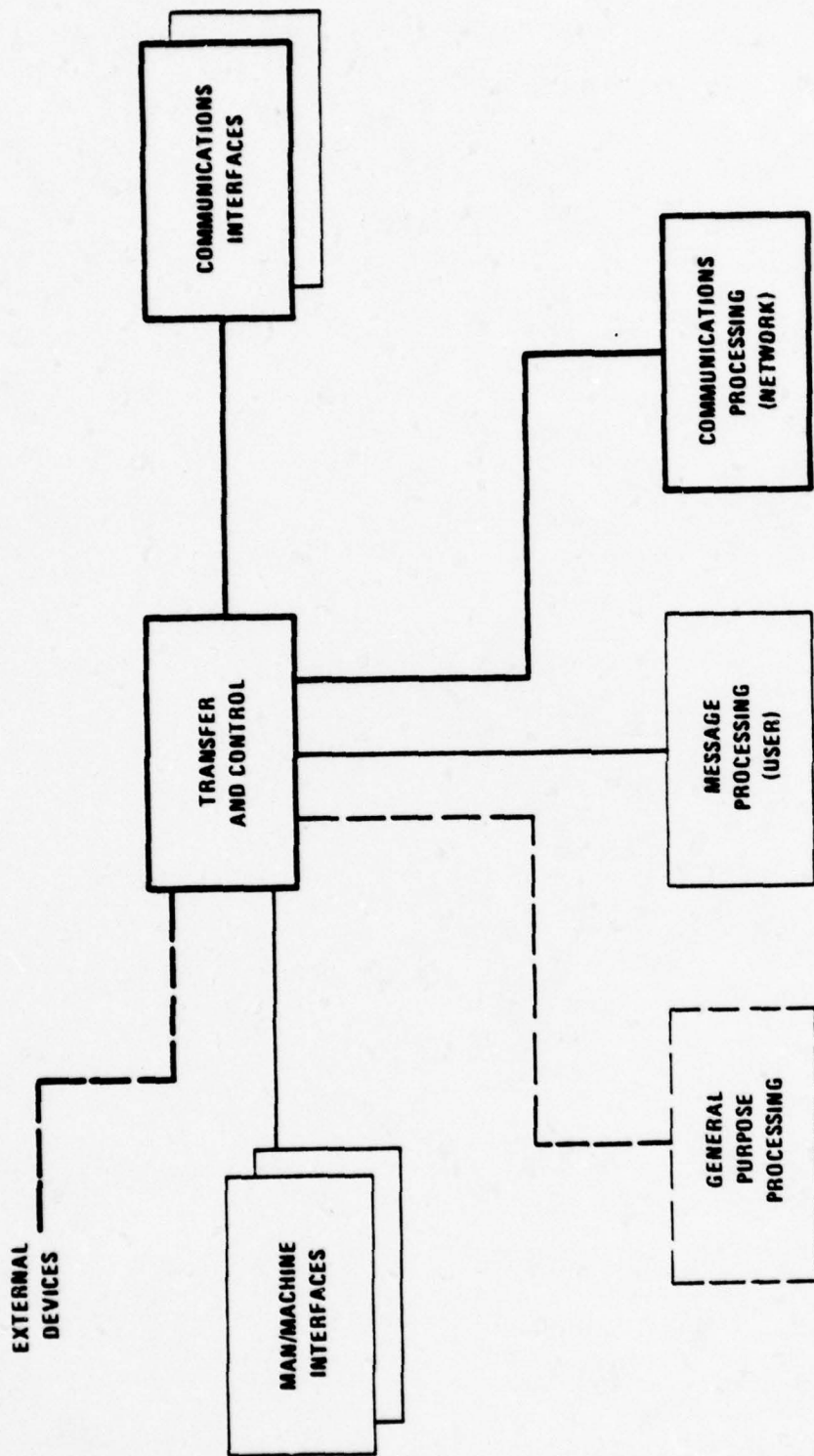
NOTE: ONLY THE PORTIONS INDICATED BY BOLD LINES ARE APPLICABLE TO THIS CATEGORY.

Figure III-1. Category I - Network Access Device (NAD)
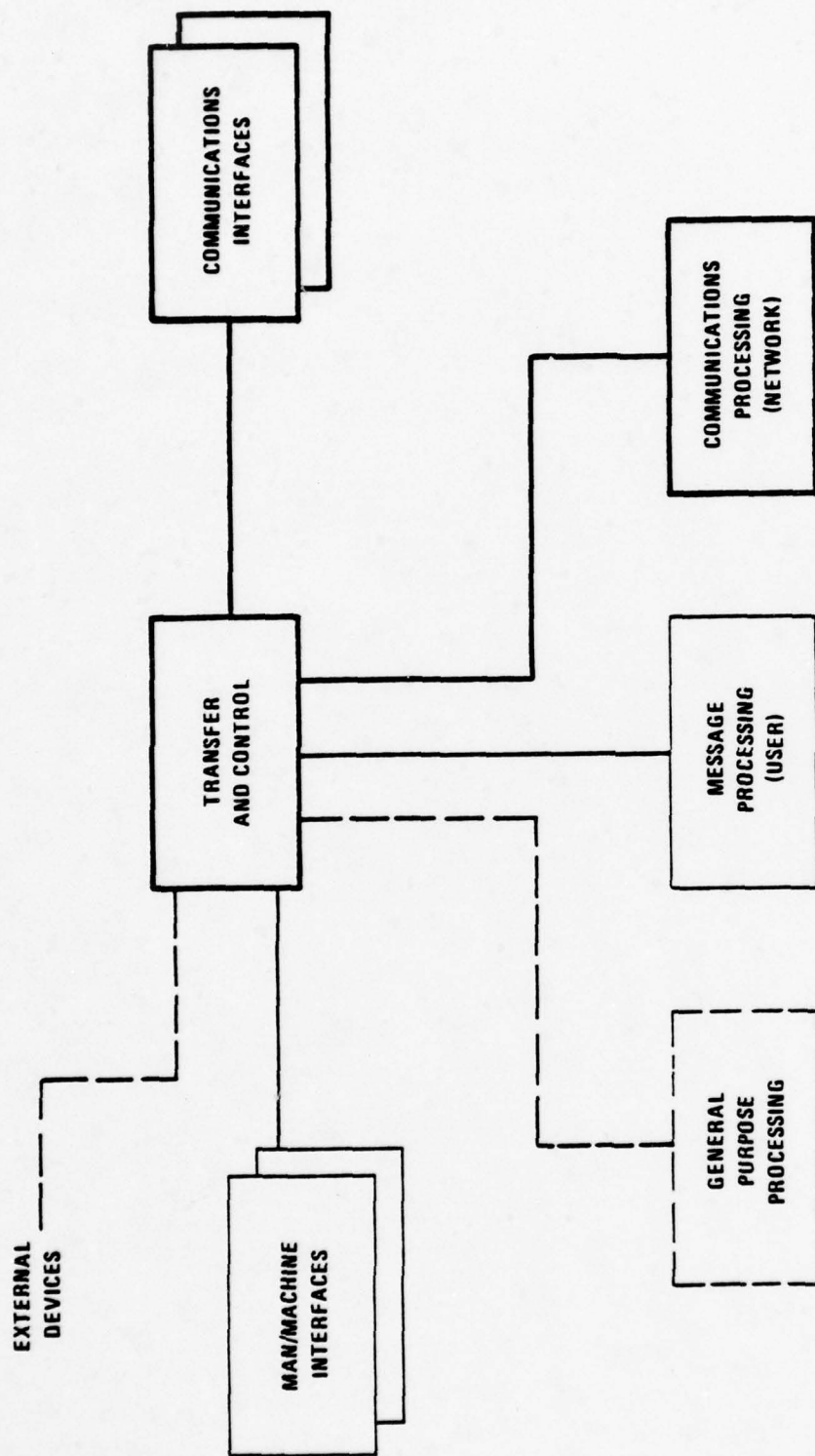
NOTE: ONLY THE PORTIONS INDICATED BY BOLD LINES ARE APPLICABLE TO THIS CATEGORY.

Figure III-2. Category II - Communications Concentrator (CC)

•   Communications Interface - Provides multiple remote terminal
     interfaces and a single interface to a higher level network
     element (PSN, I-S/A AMPE or I-S/A AMPE(E)). May also be dual
     homed to two of these network elements. The network interface
     data rate may be equal to or less than the sum of the sub-
     scriber data rates.

•   Communications Processing - Provides the necessary processing
     functions to interleave the data received from remote sub-
     scribers onto the network channel and to distribute the data
     received from the network to the subscribers. No network
     level protocols are performed.

3.   CATEGORY III - INTERACTIVE TERMINAL (I/AT)

     The interactive terminals depicted in Figure III-3 provide for hu-
man initiated input and human interpretable output from the network.
They are used for real time or near real time human/human/computer
transactions. Examples of interactive terminals are keyboard/printer
and keyboard/CRT terminals. The category includes the following func-
tional elements.

•   Man/Machine Interfaces - Consists of devices which provide a
     direct interface to an operator or via operator prepared or
     operator interpreted media. Typical input/output devices are
     keyboards, printers and visual displays.

•   Transfer and Control - Provides direct transfer of data be-
     tween input/output devices and the Communications Interface.
     Some operator assistance functions such as editing aids may be
     provided.

•   Communications Interface - Provide a single interface to a
     PSN, AMPE, I-S/A AMPE, I-S/A AMPE(E) or higher level terminal.

4.   CATEGORY IV - BASIC AUTODIN DATA TERMINAL (BADT)

     The BADT category shown in Figure III-4 provides network access via
human interactive devices or stored text media. Message processing
capabilities may also be provided. Examples of Category IV terminals
are Digital Subscriber Terminal Equipment and the UNIVAC DCT 9300/DLT
70. The functional elements of the BADT category are:
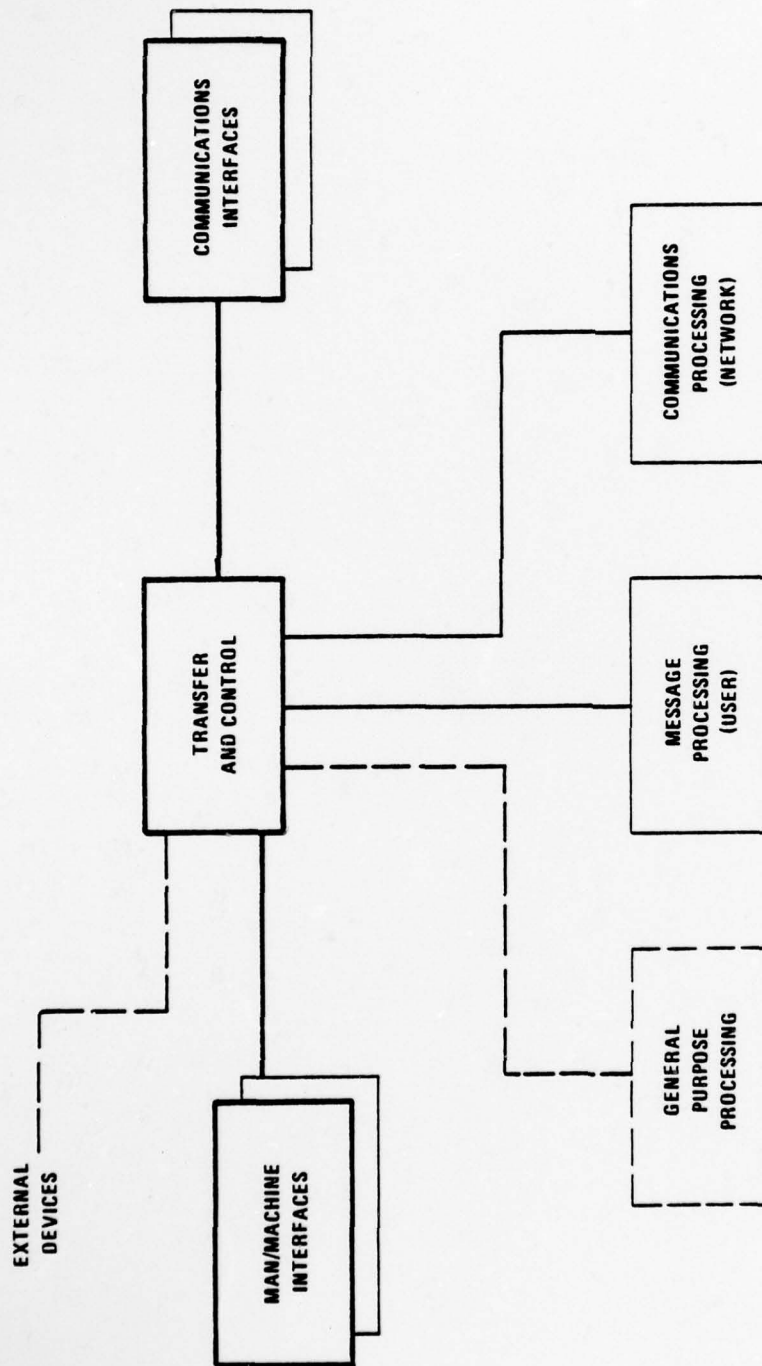
Figure III-3. Category III – Interactive Terminal (I/AT)

NOTE: ONLY THE PORTIONS INDICATED BY BOLD LINES ARE APPLICABLE TO THIS CATEGORY.
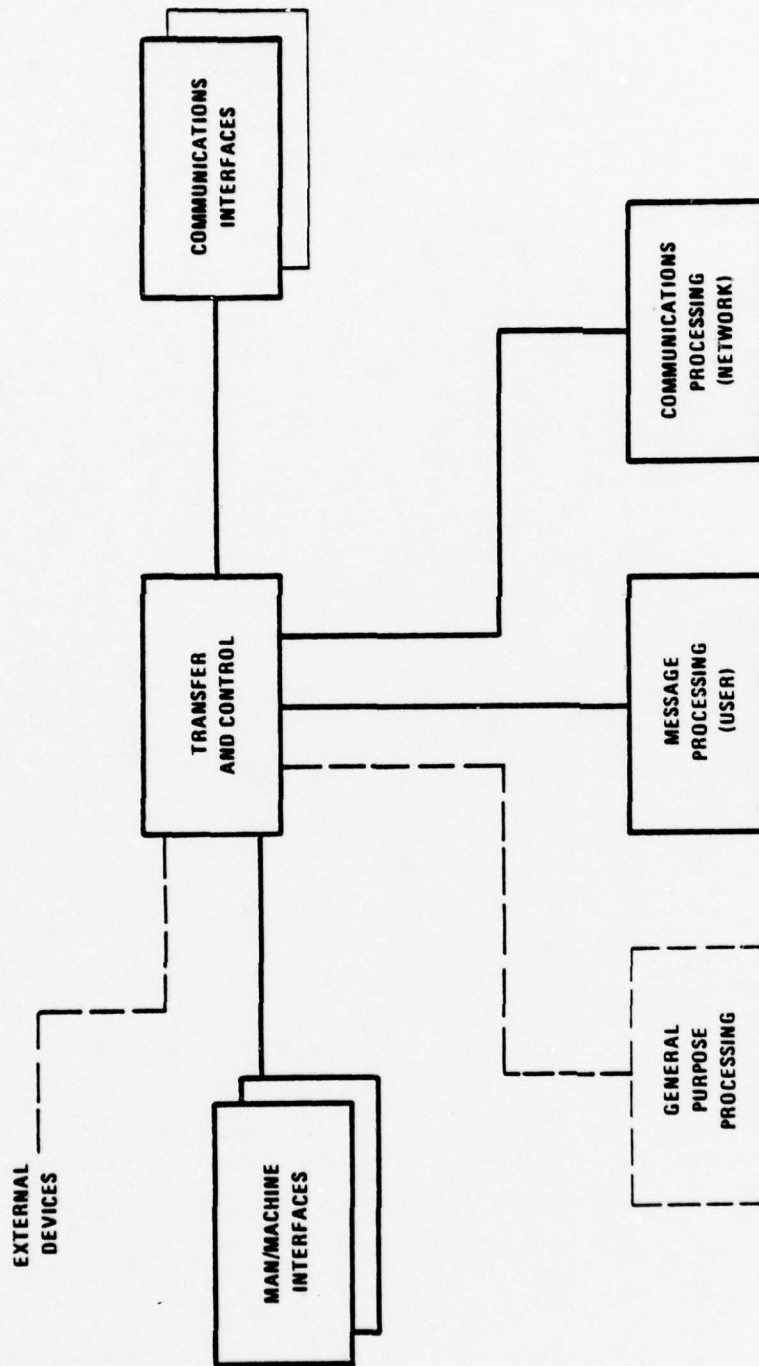
NOTE: ONLY THE PORTIONS INDICATED BY BOLD LINES ARE APPLICABLE TO THIS CATEGORY.

Figure III-4. Category IV – Basic AUTODIN Data Terminal (BADT)

.   Man/Machine Interfaces - Consist of one or more human inter-
    active devices (e.g., keyboards, printers, CRTs) or stored
    text devices (e.g., paper tape readers/punches, card readers/
    punches, magnetic tape or disk devices, etc.) for on-line
    transactions or terminal control.

.   Transfer and Control - Provides interfaces and data transfer
    among the other functional elements.

.   Communications Interfaces - Provides a single interface to a
    higher level network element (PSN, I-S/A AMPE, I-S/A AMPE(E)
    or AMPE), or may be dual homed to two of these elements.

.   Communications Processing - Provides network level protocol
    functions when required, and may also perform addressing
    assistance such as local message services.

.   Message Processing - Provides message preparation and trans-
    lation functions such as format conversions, editing, prompt-
    ing, etc.

5.   CATEGORY V - ADVANCED AUTODIN DATA TERMINAL (AADT)

The AADT category (Figure III-5) of terminals provides all the
capabilities of the BADT category, and in addition supports remote ter-
minals. The processing functions provided by the AADT are available to
remote subscribers as well as local users. Examples of Catetory V
terminals are the existing advanced SRT configurations. The functional
elements of the AADT are:

.   Man/Machine Interfaces - Consists of one or more human in-
    teractive or stored text input/output devices for on-line
    transactions or terminal control.

.   Transfer and Control - Provides interfaces and data transfer
    among the other functional elements.

.   Communications Interfaces - Provides multiple interfaces to
    remote subscribers and a single interface to a higher level
    network element (PSN, I-S/A AMPE, or I-S/A AMPE(E)), or may
    be dual homed to two of these elements.

.   Communications Processing - Provides processing related to
    message store-and-forward, remote distribution, addressing and
    network level protocols.

Figure III-5. Category V - Advanced AUTODIN Data Terminal (AADT)

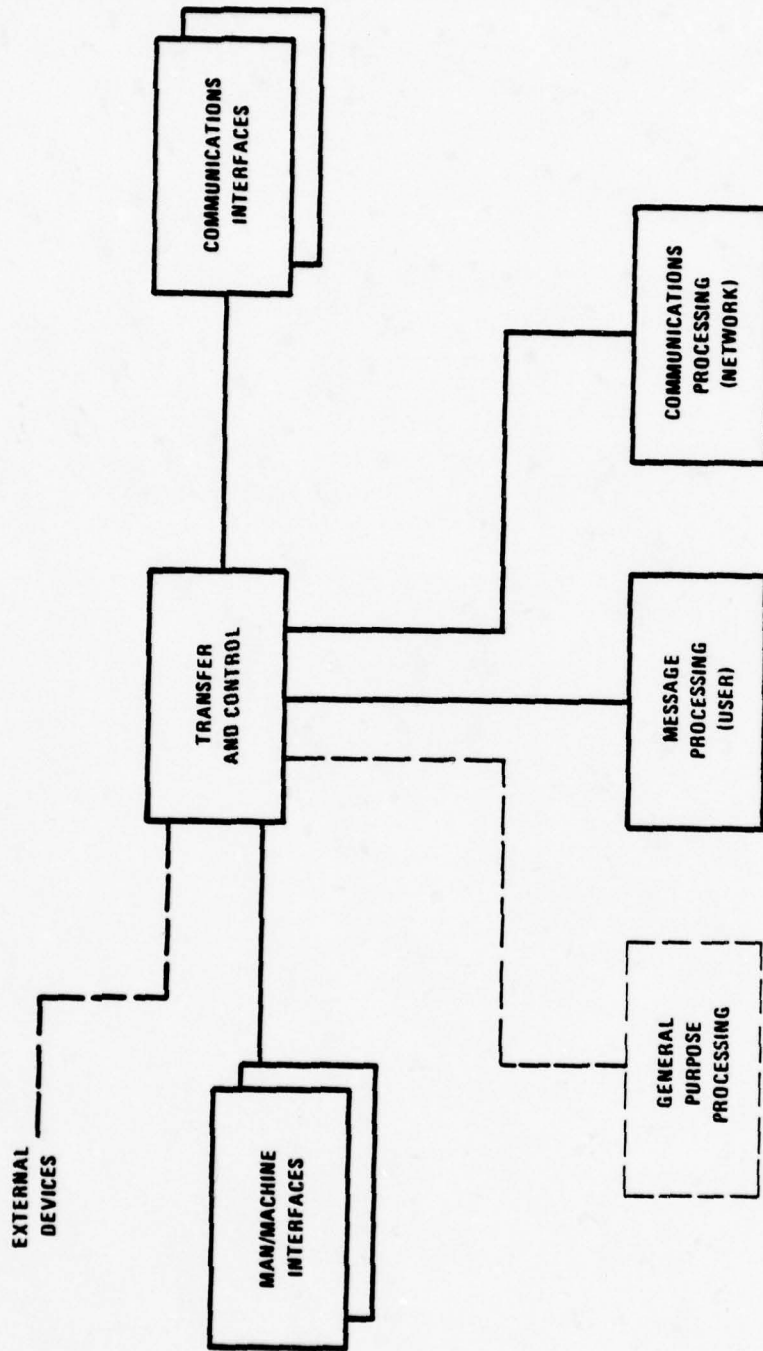NOTE: ONLY THE PORTIONS INDICATED BY BOLD LINES ARE APPLICABLE TO THIS CATEGORY.

COMMUNICATIONS INTERFACES

COMMUNICATIONS PROCESSING (NETWORK)

TRANSFER AND CONTROL

MESSAGE PROCESSING (USER)

GENERAL PURPOSE PROCESSING

EXTERNAL DEVICES

MAN/MACHINE INTERFACES

.   <u>Message Processing</u> - Provides message preparation and trans-
    lation functions such as format conversions, editing, prompt-
    ing, etc.

.   <u>External Device Interface</u> - An AADT may, in addition to its
    other functions and interfaces, provide network access to user
    specified external devices such as computer interfaces.

6.   CATEGORY VI - MESSAGE PROCESSING NODE (MPN)

The MPN is a major IAS network element. The category will ini-
tially consist of the I-S/A AMPE and I-S/A AMPE(E). The major dif-
ference between this category and the most advanced terminals of Cate-
gory V is that the MPNs provide message routing through the PSN network
using a Virtual Message Protocol (VMP). They may also provide message
processing and communications processing services for subscribers connected
elsewhere in the network as well as for directly connected subscribers.
The functional elements of the MPN category are illustrated in Figure
III-6 and include:

.   <u>Man/Machine Interfaces</u> - Consist of one or more human inter-
    active or stored text input/output devices for on-line trans-
    actions or terminal control.

.   <u>Transfer and Control</u> - Provides interfaces and data transfer
    among other functional elements.

.   <u>Communications Interfaces</u> - Provides multiple interfaces to
    terminals and higher level network elements (PSN or I-S/A
    AMPE(E)).

.   <u>Communications Processing</u> - Provides processing related to
    message store-and-forward, remote distribution addressing and
    network level protocols.

.   <u>Message Processing</u> - Provides message preparation and transla-
    tion functions such as format conversions, editing, prompting,
    etc.

.   <u>External Device Interfaces</u> - A MPN may, in addition to its
    other functions and interfaces, provide network access to user
    specified external devices such as computer interfaces.

7.   CATEGORY VII - HOST COMPUTER

A host computer provides processing services for users via the
network. It may also support local and directly connected remote users.
Host computers may have all the functional elements shown in Figure III-
7. They must conform to a standard communications interface to a PSN and
standard network level protocols. Other functions of the functional
elements are user specified.
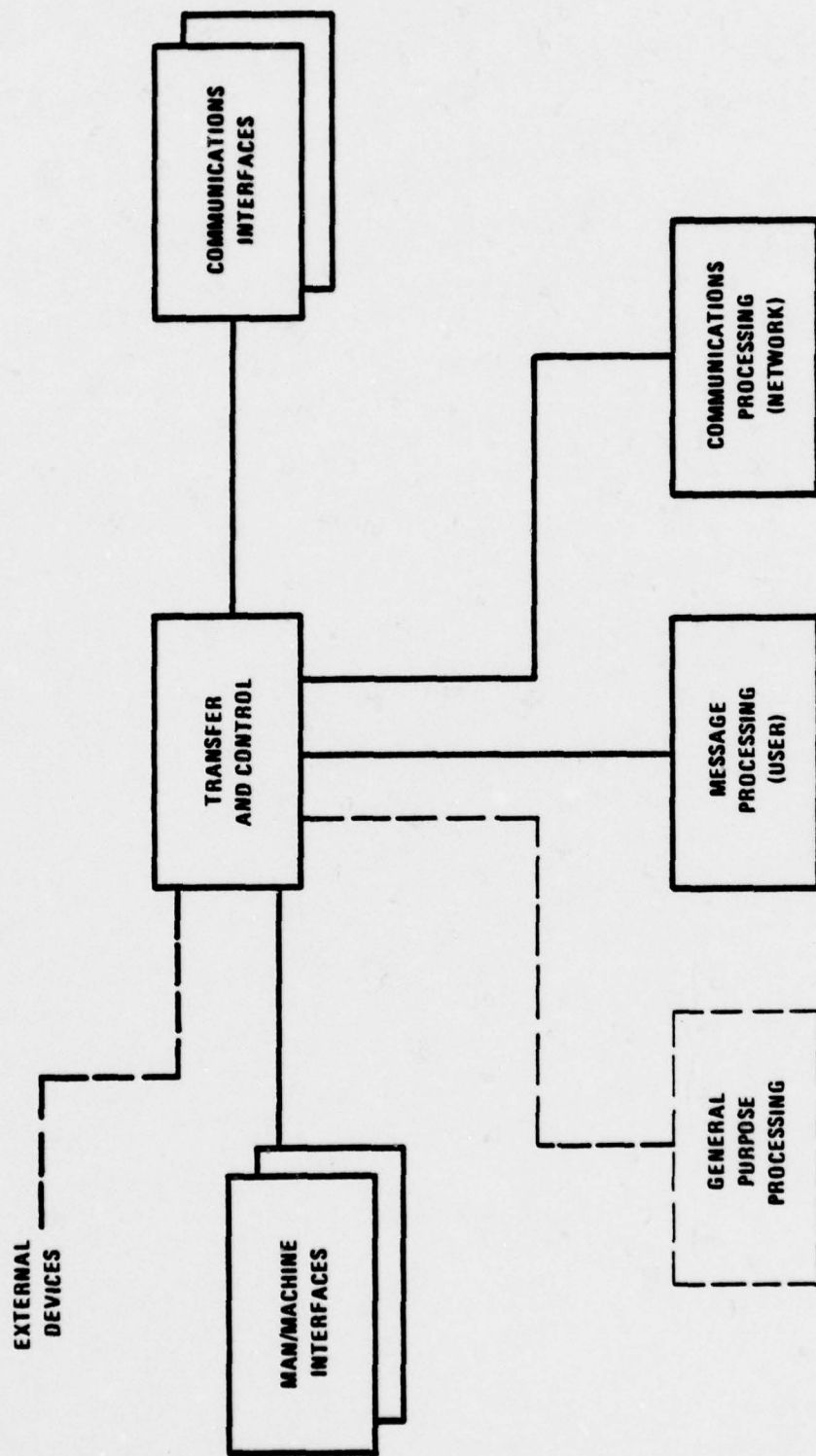
NOTE: ONLY THE PORTIONS INDICATED BY BOLD LINES ARE APPLICABLE TO THIS CATEGORY.

Figure III-6. Category VI - Message Processing Node (MPN)
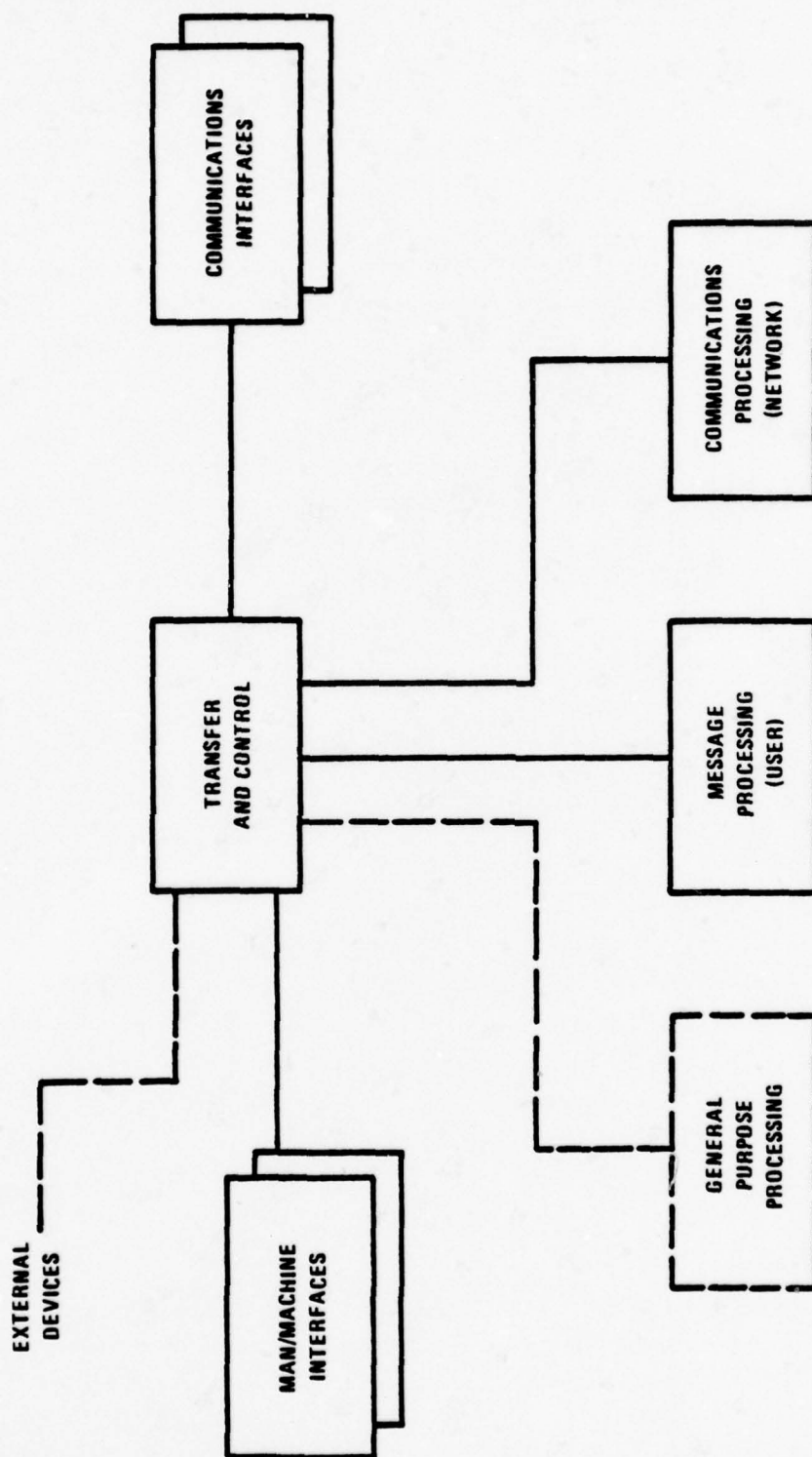
Figure III-7. Category VII - Host Computer

. <u>Man/Machine Interface</u> - Stored text and human interactive devices.

. <u>Transfer and Control</u> - Provides direct or store and forward transfer among users, internal processes and network.

. <u>Message Processing</u> - May provide operator assistance and user message processing.

. <u>General Purpose Processing</u> - Provides processing services for terminal connected and network connected users.

. <u>Communications Interfaces</u> - Single network interface (to PSN and possible multiple terminal interfaces.

. <u>Communications Processing</u> - Network level protocols and other basic communications process functions.

. <u>External Device Interfaces</u> - A Host computer may, in addition to its other functions and interfaces, provide network access to user specified external devices such as other computers.

8. SUMMARY OF CATEGORIES vs. FUNCTIONS

A summary of the allocation of major functions across the seven terminal categories defined in the preceding sections is presented in Table III-I.

TABLE III-I. SUMMARY OF CATEGORIES vs. FUNCTIONS

FUNCTIONS	TERMINAL CATEGORY						
	MAD(I)	CC(II)	I/AT (III)	BADT(IV)	AADT(V)	MPN(VII)	HOST(VIII)
COMMUNICATIONS INTERFACES	X	X	X	X	X	X	X
COMMUNICATIONS PROCESSING	X	X		X	X	X	X
MESSAGE PROCESSING		X		X	X	X	X
TRANSFER & CONTROL	X		X	X	X	X	X
MAN/MACHINE INTERFACES			X	X	X	X	X
GENERAL PURPOSE PROCESSING							X
EXTERNAL DEVICE SUPPORT	X				X	X	X

IV. RECOMMENDED RESPONSIBILITY FOR FUNCTIONAL SPECIFICATIONS

IV.   RECOMMENDED RESPONSIBILITY FOR FUNCTIONAL SPECIFICATIONS

Based on JCS MOP 165 and OSD direction, two important objectives of the IAS project are (1) to provide a framework for orderly evolution of the DoD common user data network and (2) to provide safeguards against proliferation of non-standard terminal systems. The IAS architecture developed by DCA will provide the necessary framework for accomplishing the first of these objectives. The functional specifications to be developed by DCA for each category of standard AUTODIN terminal will provide the means for accomplishing the second objective. Accordingly, the DCA developed specifications should specify those functional capabilities required to ensure successful application of the IAS architecture as well as those functional capabilities desirable to promote standardization. At the same time, the DCA developed specifications should permit the terminal users to specify all other functions according to their unique needs and applications.

In this manner each user will be permitted the flexibility necessary to satisfy requirements unique to his particular system acquisition or implementation. The first step in developing the specifications is an analysis of the functions identified in Section II and identification of those functions that should be specified by DCA vis-a-vis the terminal users. As part of this analysis, four possible levels of specification responsibility were identified:

  . D_1 - Specified by DCA in order to maintain compatibility with the IAS architecture

  . D_2 - Specified by DCA for standardization, external system compatibility or system management requirements

  .   U - Specified by user service/agency but subject to DoD standardization where applicable

  .   N - No specification required because function not applicable to this category.

All functions within each category were then evaluated and a recommended responsibility level was determined for each function. The results of this analysis process for each category is presented in Figures IV-1 through IV-7.

In some cases, it is desirable to assign specification responsibility to both DCA and the user for the same function. These cases represent a requirement for DCA to specify limits, boundaries, or constraints on the function in question in order to support the architecture or promote standardization. The user responsibility is to tailor the functional capability to his own specific needs by specifying functional details that are within the limitations imposed by the DCA specification. Such cases are indicated in the figures by recommendation for dual responsibility.

TERMINAL CATEGORY I. NAD

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS INTERFACE	D_1	D_2	U	N
1. Type and Characteristics of Lines				
. Simplex, HDX, FDX, etc.	X		X	
. Synchronous & Asynchronous	X		X	
. Line Rates	X			
. Codes-Character & Binary	X		X	
2. Link Protocols				
. AUTODIN I	X			
. AUTODIN II	X			
. User Unique			X	
. Federal Standards		X		
. National Standards		X		
. International Standards		X		
3. Concentration and Multiplexing Characteristics				X
4. Interoperability Requirements				
. Other Terminals			X	
. Network Elements	X		X	
5. Electrical Interfaces				
. Standards		X		
. Modem & Clocks		X		
6. Special Interfaces				
. COMSEC		X		
. Transmission Media		X		
7. Special Connection Function				
. Dual Homing	X			
. Multipoint	X		X	
. Loop	X		X	
. Satellite	X		X	
8. Operational/Maintenance/Test Support				
. Self Test		X		
. Status Monitor		X	X	

Figure IV-1. Category I Function and Responsibility Code Matrix

TERMINAL CATEGORY I. NAD

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS PROCESSING	D_1	D_2	U	N
1. Network Level Protocols				
. TCP & SIP	X			
. VMP, FTP	X			
2. Single/Multiple Virtual Connection Capability				
. Single Connection	X			
. Multiple Connection	X			
3. RI/Logical Address Conversion				
. Operator Assisted			X	
. Automatic	X		X	
4. Message Routing and Distribution				
. To Local Message Service Subscriber			X	
. To Remote & Network Connected Subscriber	X	X		
5. Interoperability and Special Connections				
. Other Networks		X		
. Blacker Access Control & KDC	X			
. Teleconferencing Connections	X			
. Gateways	X			
6. Communications Management/Control & Testing				
. Network Activity Log		X		
. Utilization and Error Statistics		X	X	
. Self-test			X	
. Connection Status Monitor		X		

Figure IV-1. Category I Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY I. NAD

FUNCTIONS	RESPONSIBILITY CODE			
TRANSFER & CONTROL	D_1	D_2	U	N
1. Terminal Systems Management & Executive Control				
. Processing resource and Buffer Allocation			X	
. Process to Process Interaction		X	X	
. Provide Audit/Trace for Transactions		X		
2. User to System Translation & Control				
. Code Conversion		X		
. Terminal Handler		X	X	
3. External Device Interface				
. Electrical Interface		X	X	
. Bit/byte Handshaking		X	X	
4. Security Monitor				
. User Log-on Authentication				X
. Transaction Security Validation	X			
. Security Level Separation	X			
. Security Kernel/MLS System Capability	X			
5. Failure Management				
. Operator Notification			X	
. I/O & Facility Failure Detection/Reporting		X	X	
. System Reconfiguration Management			X	
. Background Mode Test & Diagnostics			X	
6. Statistics and Report Generation				
. Activity Log		X	X	
. Terminal/Message Service Utilization Reports		X	X	
. User/Subscriber Billing Capability		X		

Figure IV-1. Category I Function and Responsibility Code Matrix (Continued)

Notes to Figure IV-1

. D_1 - Specified by DCA in order to maintain compatibility with
the IAS architecture

. D_2 - Specified by DCA for standardization, external system
compatibility or system management requirements

. U - Specified by user service/agency but subject to DoD
standardization where applicable

. N - No specification required because function not applicable
to this category.

. an X in two columns indicates combined responsibility: DCA
will specify functional limits, boundaries or constraints
in order to support overall architecture or promote standardi-
zation; users will specify additional functional requirements
within DCA limits in order to fully satisfy user unique needs.

TERMINAL CATEGORY II. CC

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS INTERFACE	D_1	D_2	U	N
1. Type and Characteristics of Lines				
. Simplex, HDX, FDX, etc.	X			
. Synchronous & Asynchronous	X			
. Line Rates	X			
. Codes-Character & Binary	X			
2. Link Protocols				
. AUTODIN I				X
. AUTODIN II	X			
. User Unique			X	
. Federal Standards				X
. National Standards				X
. International Standards				X
3. Concentration and Multiplexing Characteristics	X			
4. Interoperability Requirements				
. Other Terminals				X
. Network Elements				X
5. Electrical Interfaces				
. Standards		X		
. Modem & Clocks		X		
6. Special Interfaces				
. COMSEC		X		
. Transmission Media		X		
7. Special Connection Function				
. Dual Homing	X			
. Multipoint	X		X	
. Loop	X		X	
. Satellite	X		X	
8. Operational/Maintenance/Test Support				
. Self Test		X	X	
. Status Monitor		X	X	

Figure IV-2. Category II Function and Responsibility Code Matrix

TERMINAL CATEGORY II. CC

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS PROCESSING	D_1	D_2	U	N
1. Network Level Protocols				
. TCP & SIP				X
. VMP, FTP				X
2. Single/Multiple Virtual Connection Capability				
. Single Connection				X
. Multiple Connection				X
3. RI/Logical Address Conversion				
. Operator Assisted				X
. Automatic				X
4. Message Routing and Distribution				
. To Local Message Service Subscriber				X
. To Remote & Network Connected Subscriber				X
5. Interoperability and Special Connections				
. Other Networks				X
. Blacker Access Control & KDC				X
. Teleconferencing Connections				X
. Gateways				X
6. Communications Management/Control & Testing				
. Network Activity Log				X
. Utilization and Error Statistics				X
. Self-test		X	X	
. Connection Status Monitor				X
7. Concentration/Multiplex Data				
. Interleave Functions		X	X	

Figure IV-2. Category II Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY II. CC

FUNCTIONS	RESPONSIBILITY CODE			
TRANSFER & CONTROL	D_1	D_2	U	N
1. Terminal Systems Management & Executive Control				
. Processing resource and Buffer Allocation		X	X	
. Process to Process Interaction				X
. Provide Audit/Trace for Transactions				X
2. User to System Translation & Control				
. Code Conversion				X
. Terminal Handler				X
3. External Device Interface				
. Electrical Interface				X
. Bit/byte Handshaking				X
4. Security Monitor				
. User Log-on Authentication				X
. Transaction Security Validation				X
. Security Level Separation				X
. Security Kernel/MLS System Capability				X
5. Failure Management				
. Operator Notification				X
. I/O & Facility Failure Detection/Reporting		X	X	X
. System Reconfiguration Management				X
. Background Mode Test & Diagnostics			X	
6. Statistics and Report Generation				
. Activity Log				X
. Terminal/Message Service Utilization Reports				X
. User/Subscriber Billing Capability				X

Figure IV-2. Category II Function and Responsibility Code Matrix (Continued)

Notes to Figure IV-2

. D_1 - Specified by DCA in order to maintain compatibility with
    the IAS architecture

    .

. D_2 - Specified by DCA for standardization, external system
    compatibility or system management requirements

.   U - Specified by user service/agency but subject to DoD
    standardization where applicable

.   N - No specification required because function not applicable
    to this category.

.   an X in two columns indicates combined responsibility: DCA
    will specify functional limits, boundaries or constraints
    in order to support overall architecture or promote standardi-
    zation; users will specify additional functional requirements
    within DCA limits in order to fully satisfy user unique needs.

TERMINAL CATEGORY III. I/AT

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS INTERFACE	D_1	D_2	U	N
1. Type and Characteristics of Lines				
. Simplex, HDX, FDX, etc.		X	X	
. Synchronous & Asynchronous		X	X	
. Line Rates	X	X		
. Codes-Character & Binary		X		
2. Link Protocols				
. AUTODIN I	X			
. AUTODIN II	X			
. User Unique			X	
. Federal Standards		X		
. National Standards		X		
. International Standards		X		
3. Concentration and Multiplexing Characteristics				X
4. Interoperability Requirements				
. Other Terminals			X	
. Network Elements	X			
5. Electrical Interfaces				
. Standards		X		
. Modem & Clocks		X		
6. Special Interfaces				
. COMSEC	X			
. Transmission Media		X		
7. Special Connection Function				
. Dual Homing		X		
. Multipoint		X		
. Loop		X		
. Satellite		X		
8. Operational/Maintenance/Test Support				
. Self Test			X	
. Status Monitor		X	X	

Figure IV-3. Category III Function and Responsibility Code Matrix

TERMINAL CATEGORY III. I/AT

FUNCTIONS	RESPONSIBILITY CODE			
TRANSFER & CONTROL	D_1	D_2	U	N
1. Terminal Systems Management & Executive Control				
. Processing resource and Buffer Allocation			X	
. Process to Process Interaction				X
. Provide Audit/Trace for Transactions				X
2. User to System Translation & Control				
. Code Conversion			X	
. Terminal Handler				X
3. External Device Interface				
. Electrical Interface				X
. Bit/byte Handshaking				X
4. Security Monitor				
. User Log-on Authentication				X
. Transaction Security Validation				X
. Security Level Separation			X	
. Security Kernel/MLS System Capability				X
5. Failure Management				
. Operator Notification			X	
. I/O & Facility Failure Detection/Reporting		X	X	
. System Reconfiguration Management			X	
. Background Mode Test & Diagnostics				X
6. Statistics and Report Generation				
. Activity Log			X	
. Terminal/Message Service Utilization Reports				X
. User/Subscriber Billing Capability				X

Figure IV-3. Category III Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY III. I/AT

FUNCTIONS	RESPONSIBILITY CODE			
MAN/MACHINE INTERFACES	D_1	D_2	U	N
1. Operator-I/O Media Interface Control				
. Bit/Byte Handshaking			X	
. Media Status and Error Control			X	
2. I/O Media				
. Keyboard, Printers & Visual Displays		X	X	
. Stored Text Devices, e.g., Paper Tape, Cards, Magnetic Media, OCR, etc.				X
. Large Rotating Storage, e.g., Long Term Files, User Data, etc.				X
3. Failure Management				
. Operator Notification			X	
. Restart/Recovery				X
. Reconfiguration Management				X

Figure IV-3. Category III Function and Responsibility Code Matrix (Continued)

Notes to Figure IV-3

. D_1 - Specified by DCA in order to maintain compatibility with the IAS architecture

. D_2 - Specified by DCA for standardization, external system compatibility or system management requirements

. U - Specified by user service/agency but subject to DoD standardization where applicable

. N - No specification required because function not applicable to this category.

. an X in two columns indicates combined responsibility: DCA will specify functional limits, boundaries or constraints in order to support overall architecture or promote standardization; users will specify additional functional requirements within DCA limits in order to fully satisfy user unique needs.

TERMINAL CATEGORY IV. BADT

FUNCTIONS		RESPONSIBILITY CODE			
COMMUNICATIONS INTERFACE		D_1	D_2	U	N
1. Type and Characteristics of Lines					
	Simplex, HDX, FDX, etc.		X	X	
	Synchronous & Asynchronous		X		
	Line Rates		X		
	Codes-Character & Binary		X	X	
2. Link Protocols					
	AUTODIN I	X			
	AUTODIN II	X			
	User Unique			X	
	Federal Standards		X		
	National Standards		X	X	
	International Standards		X		
3. Concentration and Multiplexing Characteristics					X
4. Interoperability Requirements					
	Other Terminals			X	
	Network Elements		X		
5. Electrical Interfaces					
	Standards				
	Modem & Clocks		X		
6. Special Interfaces					
	COMSEC		X		
	Transmission Media		X		
7. Special Connection Function					
	Dual Homing		X		
	Multipoint		X	X	
	Loop		X	X	
	Satellite		X	X	
8. Operational/Maintenance/Test Support					
	Self Test		X	X	
	Status Monitor		X	X	

Figure IV-4. Category IV Function and Responsibility Code Matrix

TERMINAL CATEGORY IV.   BADT

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS PROCESSING	D_1	D_2	U	N
1. Network Level Protocols				
. TCP & SIP	X			
. VMP, FTP				X
2. Single/Multiple Virtual Connection Capability				
. Single Connection	X			
. Multiple Connection				X
3. RI/Logical Address Conversion				
. Operator Assisted		X	X	
. Automatic				X
4. Message Routing and Distribution				
. To Local Message Service Subscriber		X	X	
. To Remote & Network Connected Subscriber				X
5. Interoperability and Special Connections				
. Other Networks				X
. Blacker Access Control & KDC	X			
. Teleconferencing Connections	X			
. Gateways				X
6. Communications Management/Control & Testing				
. Network Activity Log		X	X	
. Utilization and Error Statistics		X	X	
. Self-test		X	X	
. Connection Status Monitor		X	X	

Figure IV-4, Category IV Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY IV. BADT

FUNCTIONS	RESPONSIBILITY CODE			
MESSAGE PROCESSING	D_1	D_2	U	N
1. Message Processing Accessability				
. Local Users			X	
. Remote Users				X
. Multiple Users from Network				X
2. Content Analysis and Distribution Determination				
. By Addressees including Logical and Collective		X		
. Format Line Indicators				X
. Cited References Key/flag Words				X
. Subject ID Codes				X
. Output Distribution				X
3. Message Preparation and Editing Aids				
. Prestored Formats		X	X	
. Addressing Assistance		X	X	
. Format Validation		X	X	
. Word Processing Edit & Storage			X	X
4. PLA/RI Conversion				X
5. Generation/Delivery of Service Messages				X
6. Message Processing Utilization and Statistics				
. Input/Output Log		X	X	
. Utilization Efficiency				
7. Accountability and Record Keeping				
. Journal/History		X		
. Recovery Snapshot				X
. PLA/RI File Maintenance				X

Figure IV-4. Category IV Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY IV. BADT

FUNCTIONS	RESPONSIBILITY CODE			
TRANSFER & CONTROL	D_1	D_2	U	N
1. Terminal Systems Management & Executive Control				
. Processing resource and Buffer Allocation			X	
. Process to Process Interaction			X	
. Provide Audit/Trace for Transactions		X	X	
2. User to System Translation & Control				
. Code Conversion		X	X	
. Terminal Handler			X	
3. External Device Interface				
. Electrical Interface			X	
. Bit/byte Handshaking			X	
4. Security Monitor				
. User Log-on Authentication				X
. Transaction Security Validation		X		
. Security Level Separation		X		
. Security Kernel/MLS System Capability				X
5. Failure Management				
. Operator Notification			X	
. I/O & Facility Failure Detection/Reporting			X	
. System Reconfiguration Management				X
. Background Mode Test & Diagnostics			X	
6. Statistics and Report Generation				
. Activity Log			X	
. Terminal/Message Service Utilization Reports		X	X	
. User/Subscriber Billing Capability		X		

Figure IV-4. Category IV Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY IV, BADT

FUNCTIONS	RESPONSIBILITY CODE			
MAN/MACHINE INTERFACES	D_1	D_2	U	N

1. Operator-I/O Media Interface Control
  . Bit/Byte Handshaking
  . Media Status and Error Control
			X
			X	

2. I/O Media
  . Keyboard, Printers & Visual Displays
  . Stored Text Devices, e.g., Paper Tape,
    Cards, Magnetic Media, OCR, etc.
  . Large Rotating Storage, e.g., Long Term
    Files, User Data, etc.
		X
		X
			X
			X
				
				X

3. Failure Management
  . Operator Notification
  . Restart/Recovery
  . Reconfiguration Management
			X
			X
				
				X

Figure IV-4. Category IV Function and Responsibility Code Matrix (Continued)

Notes to Figure IV-4

- D_1 - Specified by DCA in order to maintain compatibility with the IAS architecture

- D_2 - Specified by DCA for standardization, external system compatibility or system management requirements

- U - Specified by user service/agency but subject to DoD standardization where applicable

- N - No specification required because function not applicable to this category.

- an X in two columns indicates combined responsibility: DCA will specify functional limits, boundaries or constraints in order to support overall architecture or promote standardization; users will specify additional functional requirements within DCA limits in order to fully satisfy user unique needs.

TERMINAL CATEGORY V. AADT

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS INTERFACE	D_1	D_2	U	N
1. Type and Characteristics of Lines				
. Simplex, HDX, FDX, etc.		X	X	
. Synchronous & Asynchronous		X	X	
. Line Rates		X		
. Codes-Character & Binary		X	X	
2. Link Protocols				
. AUTODIN I	X			
. AUTODIN II	X			
. User Unique			X	
. Federal Standards		X		
. National Standards		X		
. International Standards		X		
3. Concentration and Multiplexing Characteristics				X
4. Interoperability Requirements				
. Other Terminals			X	
. Network Elements		X		
5. Electrical Interfaces				
. Standards		X		
. Modem & Clocks		X		
6. Special Interfaces				
. COMSEC		X		
. Transmission Media		X		
7. Special Connection Function				
. Dual Homing		X		
. Multipoint		X	X	
. Loop		X	X	
. Satellite		X	X	
8. Operational/Maintenance/Test Support				
. Self Test		X	X	
. Status Monitor		X	X	

Figure IV-5. Category V Function and Responsibility Code Matrix

TERMINAL CATEGORY V. AADT

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS PROCESSING	D_1	D_2	U	N
1. Network Level Protocols				
. TCP & SIP	X			
. VMP, FTP	X			
2. Single/Multiple Virtual Connection Capability				
. Single Connection	X			
. Multiple Connection	X			
3. RI/Logical Address Conversion				
. Operator Assisted		X	X	
. Automatic		X	X	
4. Message Routing and Distribution				
. To Local Message Service Subscriber		X	X	
. To Remote & Network Connected Subscriber		X		
5. Interoperability and Special Connections				
. Other Networks		X		
. Blacker Access Control & KDC	X			
. Teleconferencing Connections	X			
. Gateways	X			
6. Communications Management/Control & Testing				
. Network Activity Log		X	X	
. Utilization and Error Statistics		X	X	
. Self-test		X	X	
. Connection Status Monitor		X		

Figure IV-5. Category V Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY V. AADT

FUNCTIONS	RESPONSIBILITY CODE			
MESSAGE PROCESSING	D_1	D_2	U	N
1. Message Processing Accessability				
. Local Users			X	
. Remote Users		X		
. Multiple Users from Network		X		
2. Content Analysis and Distribution Determination				
. By Addressees including Logical and Collective		X		
. Format Line Indicators		X	X	
. Cited References Key/flag Words			X	
. Subject ID Codes		X	X	
. Output Distribution		X	X	
3. Message Preparation and Editing Aids				
. Prestored Formats		X	X	
. Addressing Assistance		X	X	
. Format Validation		X	X	
. Word Processing Edit & Storage			X	
4. PLA/RI Conversion		X		
5. Generation/Delivery of Service Messages		X	X	
6. Message Processing Utilization and Statistics				
. Input/Output Log		X	X	
. Utilization Efficiency		X	X	
7. Accountability and Record Keeping				
. Journal/History		X		
. Recovery Snapshot			X	
. PLA/RI File Maintenance		X	X	

Figure IV-5. Category V Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY V. AADT

FUNCTIONS	RESPONSIBILITY CODE			
TRANSFER & CONTROL	D_1	D_2	U	N
1. Terminal Systems Management & Executive Control				
. Processing resource and Buffer Allocation			X	
. Process to Process Interaction			X	
. Provide Audit/Trace for Transactions		X	X	
2. User to System Translation & Control				
. Code Conversion		X	X	
. Terminal Handler		X	X	
3. External Device Interface				
. Electrical Interface			X	
. Bit/byte Handshaking			X	
4. Security Monitor				
. User Log-on Authentication		X		
. Transaction Security Validation		X		
. Security Level Separation		X		
. Security Kernel/MLS System Capability	X			
5. Failure Management				
. Operator Notification			X	
. I/O & Facility Failure Detection/Reporting			X	
. System Reconfiguration Management		X		
. Background Mode Test & Diagnostics			X	
6. Statistics and Report Generation				
. Activity Log		X	X	
. Terminal/Message Service Utilization Reports		X	X	
. User/Subscriber Billing Capability		X		

Figure IV-5. Category V Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY V. AADT

FUNCTIONS	RESPONSIBILITY CODE			
MAN/MACHINE INTERFACES	D_1	D_2	U	N
1. Operator-I/O Media Interface Control				
. Bit/Byte Handshaking			X	
. Media Status and Error Control			X	
2. I/O Media				
. Keyboard, Printers & Visual Displays		X	X	
. Stored Text Devices, e.g., Paper Tape, Cards, Magnetic Media, OCR, etc.		X	X	
. Large Rotating Storage, e.g., Long Term Files, User Data, etc.			X	
3. Failure Management				
. Operator Notification			X	
. Restart/Recovery		X	X	
. Reconfiguration Management			X	

Figure IV-5. Category V Function and Responsibility Code Matrix (Continued)

Notes to Figure IV-5

. D_1 - Specified by DCA in order to maintain compatibility with the IAS architecture   -

. D_2 - Specified by DCA for standardization, external system compatibility or system management requirements

. U - Specified by user service/agency but subject to DoD standardization where applicable

. N - No specification required because function not applicable to this category.

. an X in two columns indicates combined responsibility: DCA will specify functional limits, boundaries or constraints in order to support overall architecture or promote standardization; users will specify additional functional requirements within DCA limits in order to fully satisfy user unique needs.

TERMINAL CATEGORY VI. MPN

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS INTERFACE	D_1	D_2	U	N
1. Type and Characteristics of Lines				
. Simplex, HDX, FDX, etc.		X	X	
. Synchronous & Asynchronous		X	X	
. Line Rates		X		
. Codes-Character & Binary		X	X	
2. Link Protocols				
. AUTODIN I	X			
. AUTODIN II	X			
. User Unique			X	
. Federal Standards		X		
. National Standards		X		
. International Standards		X		
3. Concentration and Multiplexing Characteristics			X	
4. Interoperability Requirements				
. Other Terminals			X	
. Network Elements		X		
5. Electrical Interfaces				
. Standards		X		
. Modem & Clocks		X		
6. Special Interfaces				
. COMSEC		X		
. Transmission Media		X		
7. Special Connection Function				
. Dual Homing		X		
. Multipoint		X	X	
. Loop		X	X	
. Satellite		X	X	
8. Operational/Maintenance/Test Support				
. Self Test		X	X	
. Status Monitor		X	X	

Figure IV-6. Category VI Function and Responsibility Code Matrix

TERMINAL CATEGORY VI. MPN

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS PROCESSING	D_1	D_2	U	N
1. Network Level Protocols				
. TCP & SIP	X			
. VMP , FTP	X			
2. Single/Multiple Virtual Connection Capability				
. Single Connection	X			
. Multiple Connection	X			
3. RI/Logical Address Conversion				
. Operator Assisted		X	X	
. Automatic		X	X	
4. Message Routing and Distribution				
. To Local Message Service Subscriber		X	X	
. To Remote & Network Connected Subscriber		X	X	
5. Interoperability and Special Connections				
. Other Networks		X		
. Blacker Access Control & KDC	X			
. Teleconferencing Connections	X			
. Gateways	X			
6. Communications Management/Control & Testing				
. Network Activity Log		X	X	
. Utilization and Error Statistics		X	X	
. Self-test		X	X	
. Connection Status Monitor		X	X	

Figure IV-6. Category VI Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY VI. MPN

FUNCTIONS	RESPONSIBILITY CODE			
MESSAGE PROCESSING	D_1	D_2	U	N
1. Message Processing Accessability				
. Local Users			X	
. Remote Users		X		
. Multiple Users from Network		X		
2. Content Analysis and Distribution Determination				
. By Addressees including Logical and Collective		X		
. Format Line Indicators		X	X	
. Cited References Key/flag Words		X	X	
. Subject ID Codes		X	X	
. Output Distribution		X	X	
3. Message Preparation and Editing Aids				
. Prestored Formats		X	X	
. Addressing Assistance		X	X	
. Format Validation		X	X	
. Word Processing Edit & Storage		X	X	
4. PLA/RI Conversion		X		
5. Generation/Delivery of Service Messages		X	X	
6. Message Processing Utilization and Statistics				
. Input/Output Log		X	X	
. Utilization Efficiency		X	X	
7. Accountability and Record Keeping				
. Journal/History		X		
. Recovery Snapshot		X		
. PLA/RI File Maintenance		X	X	

Figure IV-6. Category VI Function and Responsbility Code Matrix (Continued)

TERMINAL CATEGORY VI. MPN

FUNCTIONS	RESPONSIBILITY CODE			
TRANSFER & CONTROL	D_1	D_2	U	N
1. Terminal Systems Management & Executive Control				
. Processing resource and Buffer Allocation			X	
. Process to Process Interaction			X	
. Provide Audit/Trace for Transactions		X	X	
2. User to System Translation & Control				
. Code Conversion		X	X	
. Terminal Handler		X	X	
3. External Device Interface				
. Electrical Interface			X	
. Bit/byte Handshaking			X	
4. Security Monitor				
. User Log-on Authentication		X	X	
. Transaction Security Validation		X		
. Security Level Separation		X		
. Security Kernel/MLS System Capability	X			
5. Failure Management				
. Operator Notification			X	
. I/O & Facility Failure Detection/Reporting		X	X	
. System Reconfiguration Management		X	X	
. Background Mode Test & Diagnostics			X	
6. Statistics and Report Generation				
. Activity Log		X	X	
. Terminal/Message Service Utilization Reports		X	X	
. User/Subscriber Billing Capability		X		

Figure IV-6. Category VI Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY   VI. MPN

FUNCTIONS	RESPONSIBILITY CODE			
MAN/MACHINE INTERFACES	D_1	D_2	U	N
1. Operator-I/O Media Interface Control				
. Bit/Byte Handshaking			X	
. Media Status and Error Control			X	
2. I/O Media				
. Keyboard, Printers & Visual Displays		X	X	
. Stored Text Devices, e.g., Paper Tape, Cards, Magnetic Media, OCR, etc.		X	X	
. Large Rotating Storage, e.g., Long Term Files, User Data, etc.			X	
3. Failure Management				
. Operator Notification			X	
. Restart/Recovery		X	X	
. Reconfiguration Management		X	X	

Figure IV-6. Category VI Function and Responsibility Code Matrix (Continued)

Notes to Figure IV-6

. D_1 - Specified by DCA in order to maintain compatibility with the IAS architecture

. D_2 - Specified by DCA for standardization, external system compatibility or system management requirements

. U - Specified by user service/agency but subject to DoD standardization where applicable

. N - No specification required because function not applicable to this category.

. an X in two columns indicates combined responsibility: DCA will specify functional limits, boundaries or constraints in order to support overall architecture or promote standardization; users will specify additional functional requirements within DCA limits in order to fully satisfy user unique needs.

TERMINAL CATEGORY VII. HOST

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS INTERFACE	D_1	D_2	U	N
1. Type and Characteristics of Lines				
. Simplex, HDX, FDX, etc.		X	X	
. Synchronous & Asynchronous		X	X	
. Line Rates		X	X	
. Codes-Character & Binary		X	X	
2. Link Protocols				
. AUTODIN I	X			
. AUTODIN II	X			
. User Unique			X	
. Federal Standards		X		
. National Standards		X		
. International Standards		X		
3. Concentration and Multiplexing Characteristics			X	
4. Interoperability Requirements				
. Other Terminals			X	
. Network Elements		X		
5. Electrical Interfaces				
. Standards		X	X	
. Modem & Clocks		X	X	
6. Special Interfaces				
. COMSEC		X		
. Transmission Media		X	X	
7. Special Connection Function				
. Dual Homing		X		
. Multipoint		X	X	
. Loop		X	X	
. Satellite		X	X	
8. Operational/Maintenance/Test Support				
. Self Test		X	X	
. Status Monitor		X	X	

Figure IV-7. Category VII Function and Responsibility Code Matrix

TERMINAL CATEGORY VII. HOST

FUNCTIONS	RESPONSIBILITY CODE			
COMMUNICATIONS PROCESSING	D_1	D_2	U	N
1. Network Level Protocols				
. TCP & SIP		X		
. VMP , FTP		X		
2. Single/Multiple Virtual Connection Capability				
. Single Connection		X	X	
. Multiple Connection		X	X	
3. RI/Logical Address Conversion				
. Operator Assisted		X	X	
. Automatic		X	X	
4. Message Routing and Distribution				
. To Local Message Service Subscriber		X	X	
. To Remote & Network Connected Subscriber		X	X	
5. Interoperability and Special Connections				
. Other Networks		X	X	
. Blacker Access Control & KDC		X		
. Teleconferencing Connections		X	X	
. Gateways		X		
6. Communications Management/Control & Testing				
. Network Activity Log		X	X	
. Utilization and Error Statistics		X	X	
. Self-test			X	
. Connection Status Monitor		X	X	

Figure IV-7. Category VII Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY VII. HOST

FUNCTIONS	RESPONSIBILITY CODE			
MESSAGE PROCESSING	D_1	D_2	U	N
1. Message Processing Accessability				
. Local Users			X	
. Remote Users			X	
. Multiple Users from Network		X	X	
2. Content Analysis and Distribution Determination				
. By Addressees including Logical and Collective			X	
. Format Line Indicators		X	X	
. Cited References Key/flag Words			X	
. Subject ID Codes			X	
. Output Distribution			X	
3. Message Preparation and Editing Aids				
. Prestored Formats		X	X	
. Addressing Assistance		X	X	
. Format Validation		X	X	
. Word Processing Edit & Storage			X	
4. PLA/RI Conversion		X	X	
5. Generation/Delivery of Service Messages		X	X	
6. Message Processing Utilization and Statistics				
. Input/Output Log			X	
. Utilization Efficiency			X	
7. Accountability and Record Keeping				
. Journal/History		X	X	
. Recovery Snapshot			X	
. PLA/RI File Maintenance			X	

Figure IV-7. Category VII Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY VII. HOST

FUNCTIONS	RESPONSIBILITY CODE			
TRANSFER & CONTROL	D_1	D_2	U	N
1. Terminal Systems Management & Executive Control				
. Processing resource and Buffer Allocation			X	
. Process to Process Interaction			X	
. Provide Audit/Trace for Transactions		X	X	
2. User to System Translation & Control				
. Code Conversion			X	
. Terminal Handler			X	
3. External Device Interface				
. Electrical Interface			X	
. Bit/byte Handshaking			X	
4. Security Monitor				
. User Log-on Authentication			X	
. Transaction Security Validation			X	
. Security Level Separation		X	X	
. Security Kernel/MLS System Capability		X	X	
5. Failure Management				
. Operator Notification			X	
. I/O & Facility Failure Detection/Reporting			X	
. System Reconfiguration Management			X	
. Background Mode Test & Diagnostics			X	
6. Statistics and Report Generation				
. Activity Log			X	
. Terminal/Message Service Utilization Reports		X	X	
. User/Subscriber Billing Capability		X	X	

Figure IV-7. Category VII Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY VII. HOST

FUNCTIONS	RESPONSIBILITY CODE			
MAN/MACHINE INTERFACES	D_1	D_2	U	N

1. Operator-I/O Media Interface Control
  . Bit/Byte Handshaking
  . Media Status and Error Control
			X
			X	

2. I/O Media
  . Keyboard, Printers & Visual Displays
  . Stored Text Devices, e.g., Paper Tape,
     Cards, Magnetic Media, OCR, etc.
  . Large Rotating Storage, e.g., Long Term
     Files, User Data, etc.
			X
			X
			
			X	

3. Failure Management
  . Operator Notification
  . Restart/Recovery
  . Reconfiguration Management
			X
			X
			X	

Figure IV-7. Category VII Function and Responsibility Code Matrix (Continued)

TERMINAL CATEGORY VII. HOST

FUNCTIONS	RESPONSIBILITY CODE			
GENERAL PURPOSE PROCESSING	D_1	D_2	U	N
1. Host Processing and Applications Programs			X	
2. User Provided Message Processing Functions		X	X	

Figure IV-7. Category VII Function and Responsibility Code Matrix (Continued)

Notes to Figure IV-7

. D_1 - Specified by DCA in order to maintain compatibility with the IAS architecture

. D_2 - Specified by DCA for standardization, external system compatibility or system management requirements

. U - Specified by user service/agency but subject to DoD standardization where applicable

. N - No specification required because function not applicable to this category.

. an X in two columns indicates combined responsibility: DCA will specify functional limits, boundaries or constraints in order to support overall architecture or promote standardization; users will specify additional functional requirements within DCA limits in order to fully satisfy user unique needs.

V. CONCLUSIONS AND RECOMMENDATIONS

V. CONCLUSIONS AND RECOMMENDATIONS

1. CONCLUSIONS

The Common Family of AUTODIN Terminals has been described in terms of seven terminal categories covering a broad range of application and overall capabilities. The terminal categories are:

I	-	Network Access Device
II	-	Communications Concentrator
III	-	Interactive Terminal
IV	-	Basic AUTODIN Data Terminal
V	-	Advanced AUTODIN Data Terminal
VI	-	Message Processing Node
VII	-	Host Computer

Each category can be uniquely characterized in terms of functional building blocks which comprise the basic functional elements of the full range of terminal capabilities envisioned for IAS. The functional elements are:

- Communications Interfaces
- Communications Processing
- Message Processing
- Transfer and Control
- Man/Machine Interfaces
- General Purpose Processing

Classification of the terminals according to the above categories and functional elements provides a structure from which functional specification of the common family of terminals can readily evolve. The terminal categories identify the types of terminal for which specifications must be developed. The functional elements provide a framework for both hardware and software modularization of the terminals. Commonality of modules among the terminals will permit graceful growth from the smallest configuration to the largest.

2. RECOMMENDATIONS

The analysis and results presented in this report are consistent with the following recommendations:

- Develop functional specifications for each of the seven categories of AUTODIN terminals envisioned for IAS implementation

.   Structure all functional specifications according to the functional building blocks derived by this analysis

.   Seek further terminal modularity through a detailed analysis of all terminal functions for the purpose of identifying distinct functional sub-elements of the six basic functional building blocks.

APPENDIX A - PRELIMINARY FUNCTIONAL SPECIFICATION OUTLINE
              FOR THE COMMON FAMILY OF AUTODIN TERMINALS

APPENDIX A
PRELIMINARY FUNCTIONAL SPECIFICATION OUTLINE FOR THE
COMMON FAMILY OF AUTODIN TERMINALS

This appendix presents the recommended outlines for the functional specifications to be developed under the IAS project. These functional specifications will be used by DCA and the ASD (C^3I) as a means of promoting standardization among AUTODIN terminal systems and ensuring implementation of the IAS architecture. As a result, the DCA developed functional specification for each standard category will address only those portions of the total terminal functions requiring DCA control/ description. Remaining functions will be specified by the terminal users. The specification outline for each terminal category, therefore, reflects the recommended DCA specification responsibilities defined in Section IV of this report for each category. It is noted that the specification outlines are preliminary and subject to further revision as a result of future IAS architecture definition and related analysis.

A general outline for the standard AUTODIN terminal functional specification, based on MIL-STD-490, is presented in Table A-I. The outline represents a Type B1 specification in format, although the format differences between Type A, B1 and C1a specifications are not major. In terms of content, the outline in Table A-I represents a Type A specification (which states the technical and mission requirements of each terminal category, allocates requirements to functional areas, and defines interfaces between and among functions) that has been expanded to include those Type B1 specification details (requirements for the design or engineering development of each terminal category) that can be identified at this stage of IAS development. The proposed format is appropriate for the AUTODIN terminal functional specifications for several reasons:

. it allows both topdown and bottomup definition of the terminal and its role in the IAS

. it allows full description of the DCA prescribed functions of the terminal

. it facilitates expansion/incorporation into MIL DEP product development specifications.

In addition, the use of a familiar MIL-STD-490 type format will promote understanding and acceptance by MIL DEP/Agency users. Expanded outlines for Section 3.7 (Functional Performance Requirements) of the functional specification format for several sample categories of standard AUTODIN terminal are included as Tables A-II through A-IV. These outlines address the specific functional areas appropriate to each sample category and are intended to illustrate the degree of specification required for each category.

TABLE A-I. GENERAL OUTLINE FOR AUTODIN TERMINAL FUNCTIONAL SPECIFICATIONS

TABLE A-II. FUNCTIONAL SPECIFICATION (SECTION 3.7)
OUTLINE FOR CATEGORY I, NAD

3.7.1	Communication Interface Requirements
3.7.1.1	Line Characteristics
3.7.1.2	Codes & Rates
3.7.1.3	Link Protocols
3.7.1.3.1	AUTODIN I
3.7.1.3.2	AUTODIN II
3.7.1.3.3	Federal Standards
3.7.1.3.4	National Standards
3.7.1.3.5	International Standards
3.7.1.4	Interoperability Requirements
3.7.1.4.1	NAD to I-S/A AMPE
3.7.1.4.2	NAD to I-S/A AMPE(E)
3.7.1.5	Electrical Interfaces
3.7.1.5.1	Standards
3.7.1.5.2	Modems, Clocks
3.7.1.5.3	Patch and Test Facilities
3.7.1.6	Special Interfaces
3.7.1.6.1	COMSEC
3.7.1.6.2	Transmission Media
3.7.1.7	Special Connection Functions
3.7.1.7.1	Dual Homing
3.7.1.7.2	Multipoint
3.7.1.7.3	Loop
3.7.1.8	Operational/Maintenance/Test Support
3.7.1.8.1	Self-test
3.7.1.8.2	Status Monitor
3.7.2	Communications Processing Requirements
3.7.2.1	Network Level Protocols
3.7.2.1.1	TCP
3.7.2.1.2	SIP
3.7.2.1.3	VMP
3.7.2.1.4	FTP
3.7.2.2	Virtual Connection Capability
3.7.2.2.1	Single Connections
3.7.2.2.2	Multiple Connections
3.7.2.3	RI/Logical Address Conversion (Automatic)
3.7.2.4	Message Routing and Distribution
3.7.2.5	Interoperability and Special Connections
3.7.2.6	Communications Management/Control and Testing
3.7.2.6.1	Network Activity Log
3.7.2.6.2	Utilization and Error Statistics
3.7.2.6.3	Connection Status Monitor
3.7.3	Message Processing Requirements (N/A)
3.7.4	Transfer and Control Requirements
3.7.4.1	Systems Management and Executive Control
3.7.4.1.1	Process to Process Interaction Control
3.7.4.1.2	Audit/Trace Function for all Transactions
3.7.4.2	User to System Translation and Control
3.7.4.2.1	Command Interpreter

TABLE A-II. FUNCTIONAL SPECIFICATION (SECTION 3.7)
OUTLINE FOR CATEGORY I, NAD (Continued)

3.7.4.2.2	Code Conversions
3.7.4.2.3	Operator/User Terminal Handler
3.7.4.3	External Device Interface
3.7.4.3.1	Electrical Interface
3.7.4.3.2	Bit/Byte Handshaking
3.7.4.4	Security Monitor
3.7.4.4.1	Transaction Security Validation
3.7.4.4.2	Security Level Separation
3.7.4.4.3	Security Kernal Functions
3.7.4.5	System Failure Management
3.7.4.6	Statistics and Report Generation
3.7.4.6.1	System Activity Log
3.7.4.6.2	Terminal/Message Service Utilization Reports
3.7.4.6.3	User/Subscriber Billing Function
3.7.5	Man/Machine Interface Requirements (N/A)

TABLE A-III. FUNCTIONAL SPECIFICATION (SECTION 3.7)
OUTLINE FOR CATEGORY II, CC

3.7.1	Communication Interface Requirements
3.7.1.1	Line Characteristics
3.7.1.2	Codes & Rates
3.7.1.3	Link Protocols
3.7.1.3.1	Unique Protocols
3.7.1.4	Concentration and Multiplexing Characteristics
3.7.1.4.1	Concentration/Multiplexing Technique
3.7.1.4.2	Bit and Data Interleave
3.7.1.5	Electrical Interfaces
3.7.1.5.1	Standards
3.7.1.5.2	Modems, Clocks & Patch and Test Facility
3.7.1.6	Special Interfaces
3.7.1.6.1	COMSEC
3.7.1.6.2	Transmission Media (i.e., Satellite)
3.7.1.7	Special Connections Function
3.7.1.7.1	Dual Homing
3.7.1.7.2	Multipoint
3.7.1.7.3	Loop
3.7.1.8	Operational/Maintenance/Test Support
3.7.1.8.1	Self-Test
3.7.1.8.2	Status Monitor
3.7.2	Communication Processing Requirements
3.7.2.1	Concentration/Multiplexing Technique
3.7.2.2	Data/Character Interleave Control
3.7.3	Transfer and Control Requirements
3.7.3.1	Systems Management & Executive
3.7.3.2	Processing Resource and Buffer Allocation
3.7.3.3	Facility Failure Detection/Reporting
3.7.3.4	Background Mode Test and Diagnostics

TABLE A-IV.   FUNCTIONAL SPECIFICATION (SECTION 3.7)
OUTLINE FOR CATEGORY VI, MPN

TABLE A-IV. FUNCTIONAL SPECIFICATION (SECTION 3.7)
OUTLINE FOR CATEGORY VI, MPN (Continued)

TABLE A-IV. FUNCTIONAL SPECIFICATION (SECTION 3.7)
OUTLINE FOR CATEGORY VI, MPN (Continued)

3.7.2.4.5	System Failure Management
3.7.2.4.5.1	Operator Notification & Failure Log
3.7.2.4.5.2	I/O & Facility Failure Detection/Reporting
3.7.2.4.5.3	System Reconfiguration Management
3.7.2.4.5.4	Background Mode Test & Diagnostics
3.7.2.4.6	Statistics and Report Generation
3.7.2.4.6.1	System Activity Log
3.7.2.4.6.2	Terminal/Message Service Utilization Reports
3.7.2.4.6.3	User/Subscriber Billing Function
3.7.2.5	Man/Machine Interface Requirements
3.7.2.5.1	I/O Media Interface Control
3.7.2.5.1.1	Bit/Byte Handshaking
3.7.2.5.1.2	Media Status and Error Control
3.7.2.5.2	I/O Media
3.7.2.5.2.1	Keyboard, Printers & Visual Displays
3.7.2.5.2.2	Stored Text Devices: e.g., Paper Tape, Cards, Magnetic Media, OCR, etc.
3.7.2.5.2.3	Large Rotating Storage: e.g., Long Term Files, User Data Storage, etc.
3.7.2.5.3	I/O Failure Management
3.7.2.5.3.1	Operator Notification
3.7.2.5.3.2	I/O Restart/Recovery
3.7.2.5.3.3	I/O Reconfiguration Management
3.7.3	Enhanced Inter-Service/Agency AMPE Requirements (Same Outline as 3.7.2)

REFERENCES

1. "Integrated AUTODIN System (IAS) Mid-Term Architecture Definitions," Booz·Allen & Hamilton, Inc., December 7, 1978

2. "Telecommunications Oriented Automated Message Handling Systems Report," DCA/Code 534, June, 1978

3. "Approved DCS AUTODIN Terminal (Hardware and Software) Systems," DCA Circular 310-D130-3, May, 1978